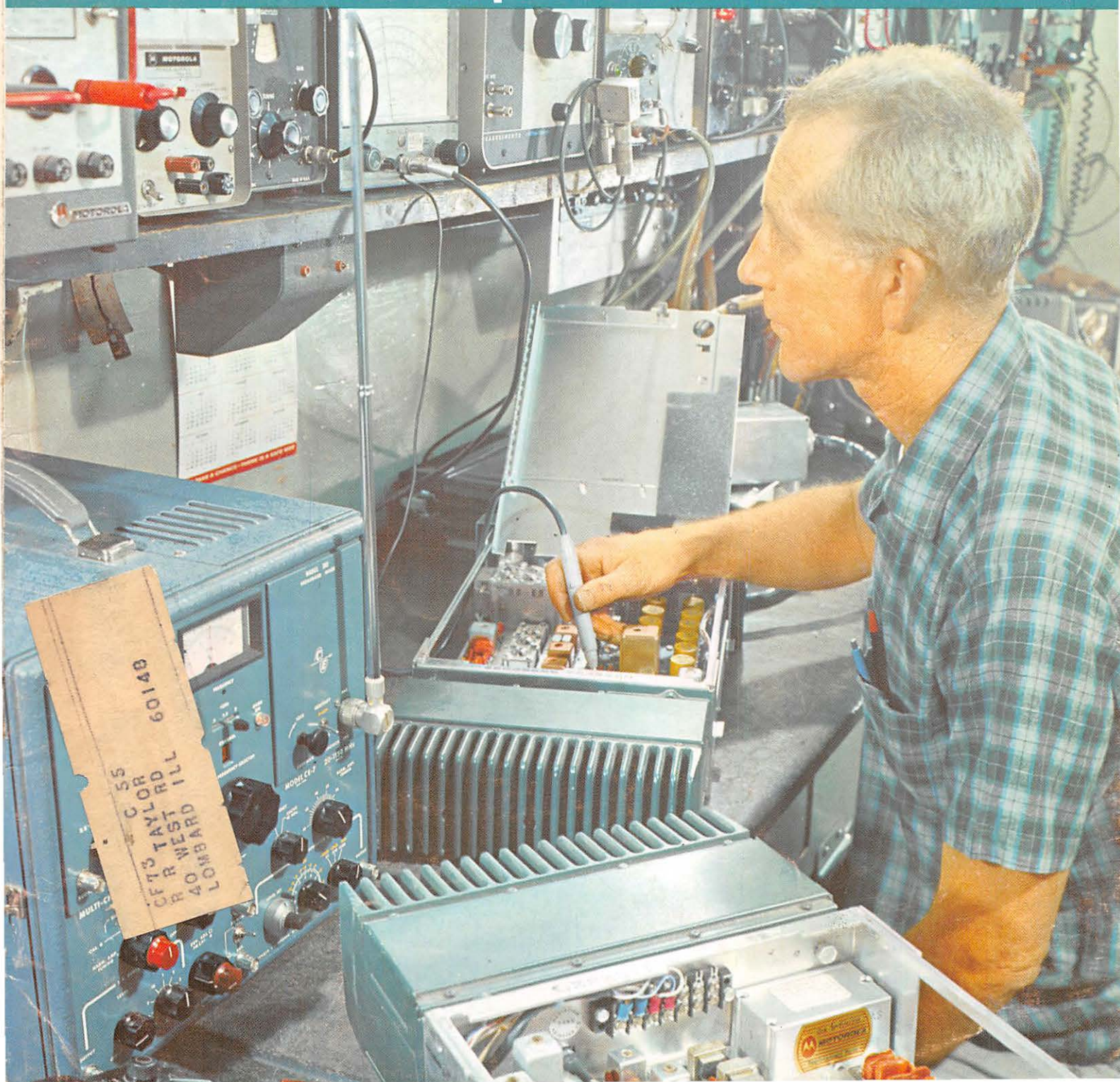
JUNE 1970

# rsc

RAILWAY SYSTEM CONTROLS

## Santa Fe finds a better way for communications maintenance



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# new fm 2-way radio

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JUNE 1970 VOL. 1 NO. 3

# RSC RAILWAY SYSTEM CONTROLS

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# A short while back, there was a lot of noise about solid-state microwave systems.

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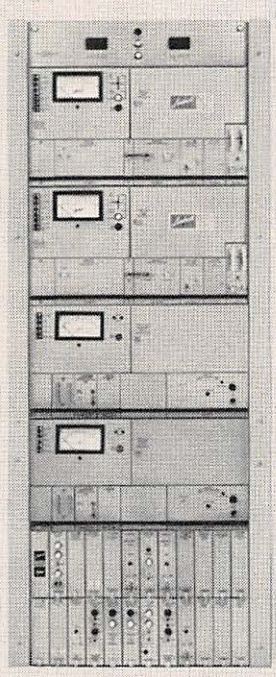

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Now Lenkurt engineering offers 1200 channels in the common carrier band. And 600 channels in the industrial band. Both with superior performance at reduced deviations.

And that means a quiet signal.

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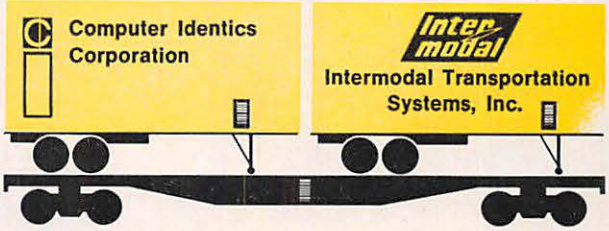


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NIFE nickel cadmium battery reliability now serves the Illinois Central.

For automatic highway crossing protection, classification yard control, track circuits, automatic block signals.

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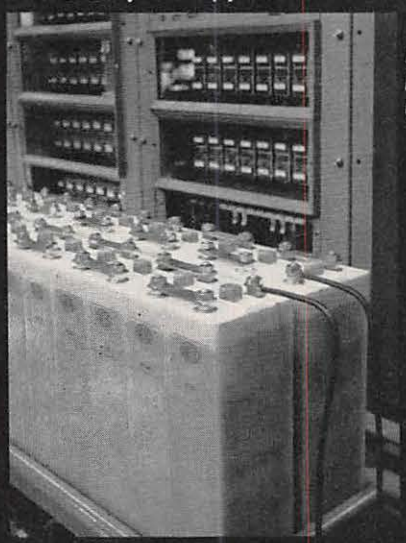
NIFE's full line of RP and RS railway signaling batteries includes sizes to 407 ampere-hour capacities in plastic containers, and even larger in steel. For railroad applications requiring high-discharge currents, such as for car retarders and stationary engine cranking, NIFE cell types HIP/HI and MDP/MD are available in a variety of ampere-hour capacities.

NIFE also manufactures solid-state battery chargers and battery/charger consoles for special applications.

Ask for your copy of NIFE's railway-battery catalog.



*NIFE 32-volt RP-168 CTC battery installed at ICRR Headquarters.*

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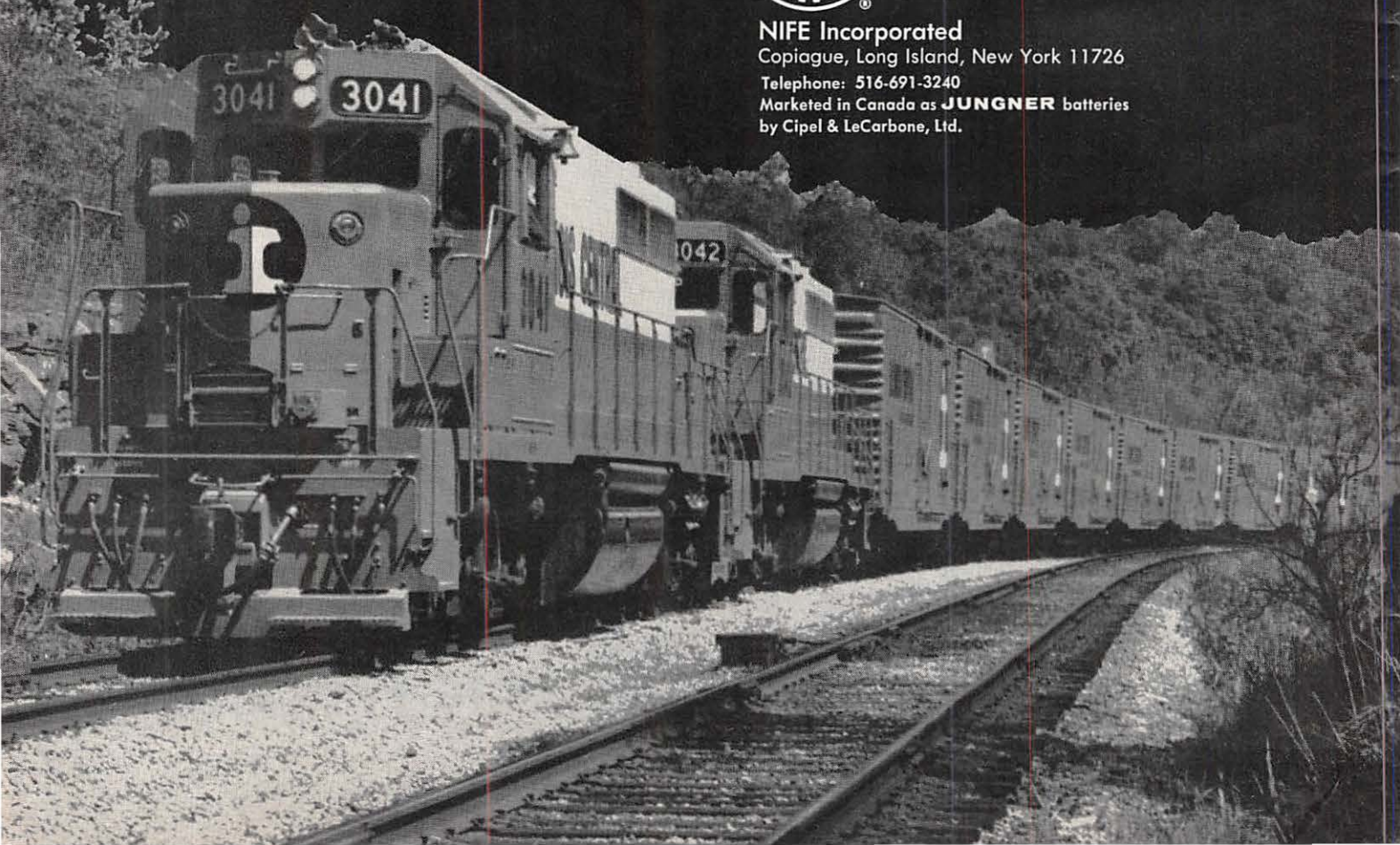

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2. New aluminum extruded cabinet with P.C. back panel.
3. New terminal configuration requiring less signal case space.
4. New improved lightning protection.
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Grain Valley, Missouri 64029
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**quality**
these batteries
really have

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**Performance**
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**Required Maintenance**
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**Ease of Handling and Installation**
*(advantages that your field men can best appreciate)*

**and compare**

**with any signal storage battery you are now using**

Join the thirty-five major railroads which have already made—or are now making—this important evaluation.

GET SOMETHING **NEW** GOING FOR YOU! YOU'LL BE GLAD YOU DID

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# tune in this great new radio show for the 70's

These are three of the superstar performers in the WABCO industrial radio lineup. The Portable 2.2, the 3R/3V/3D, and the 5W CARRYPHONE® radios offer the latest innovations in radio design. Modular plug-ins, solid state operation, interchangeability, easy serviceability, lightweight, rugged construction, and prices competitive or lower than comparable radios.

**WABCO ON THE AIR**

Put a rugged, reliable WABCO radio to work on your job for improved communications and long service life. For complete information on any of the three radios shown below or a free demonstration, contact your WABCO Sales Representative. Or write Westinghouse Air Brake Company, Signal & Communications Division, Pittsburgh, Pennsylvania 15218.

**WABCO 5W CARRYPHONE®**
- modular plug-in battery pack circuitry
- uses industrial D-Cell batteries (2 less than competitive models)
- rechargeable Nicad battery pack available
- option of either handset or microphone
- foolproof battery box
- swing out frame for easy servicing

**WABCO Portable 2.2**
- weighs 30 ounces, displaces 47½ cu. in.
- 14 plug-in modules
- compatible with all VHF-FM systems
- complete line of accessories
- most power per ounce of any hand-held portable on the market
- rugged construction—exceeds military environment tests specs for temperature, humidity, vibration and shock
- average repair time: 8 minutes
- priced $75 to $100 lower than competitive models

**WABCO 3R/3V/3D**
- 3R—locomotives, cabooses and base stations
- 3V—vehicle trunk mount
- 3D—vehicle dash mount
- smallest 35 watt radio on the market
- plug-in modules
- transmitter and receiver interchangeable with all WABCO models
- low standby drain
- accessories for any system
- proven reliability and performance in railroad market for 1½ years
- quiet line (tone squelch)

WABCO

An American-Standard Company

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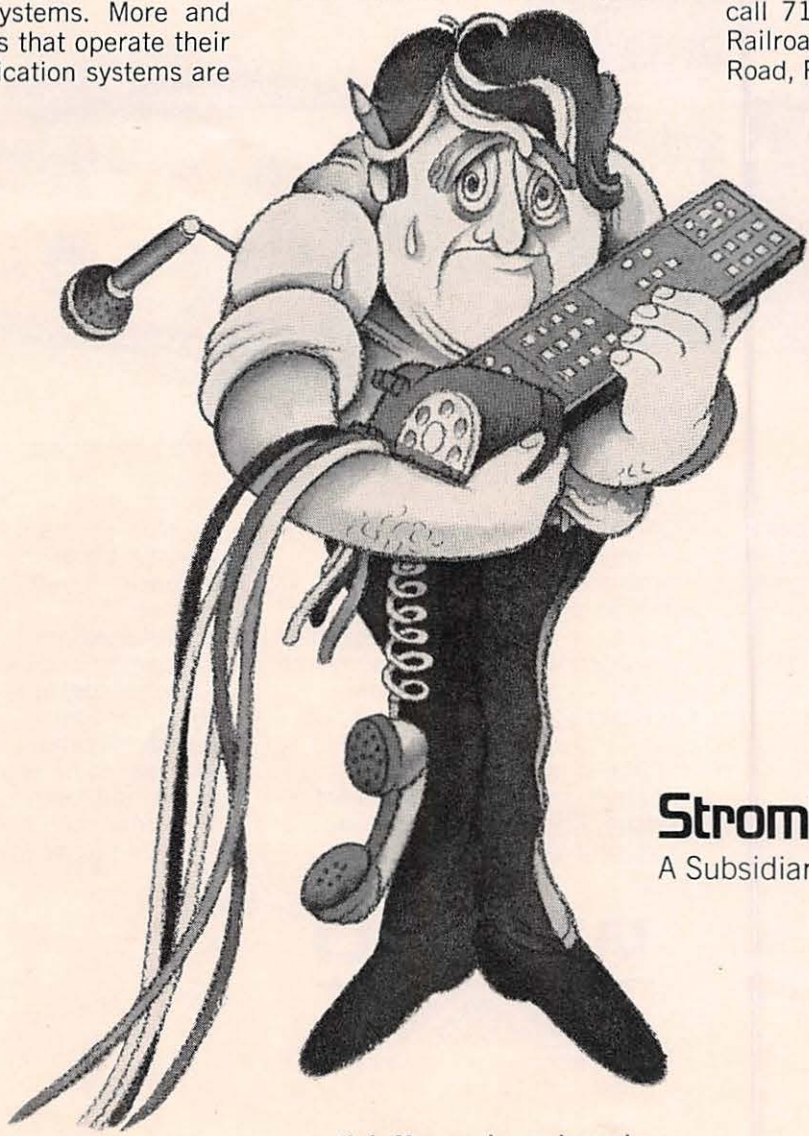
# Bits and pieces, odds and ends: Who wants a piecemeal communication system when freight revenue is at stake?

A system of diverse bits and pieces of communications gear from scattered sources can't be the best way to serve the telephone and data needs of your railroad. An objectively designed, completely integrated system is required to do the total communications job—the Systematics approach, from Stromberg-Carlson, the source of complete end-to-end systems.

We plan, design, service communication systems. More and more railroads that operate their own communication systems are buying them from Stromberg-Carlson. Our systems in actual operation include 252 PABX's (serving over 18,000 telephones); forty 4-wire network switching systems (handling over 2500 circuits).

The Systematics approach to problems keeps on delivering reliable communications for control and for administration long after installation. Because every system and every piece of equipment is fully backed by our total support services. The result of this objective and analytical approach to your communications needs by experts in this field is a unified system designed to your present and future service and that really delivers when you need it.

For the story on Stromberg-Carlson communication systems, call 716-482-2200. Or write to: Railroad Division, 100 Carlson Road, Rochester, N. Y. 14603.



**Stromberg-Carlson**
A Subsidiary of General Dynamics

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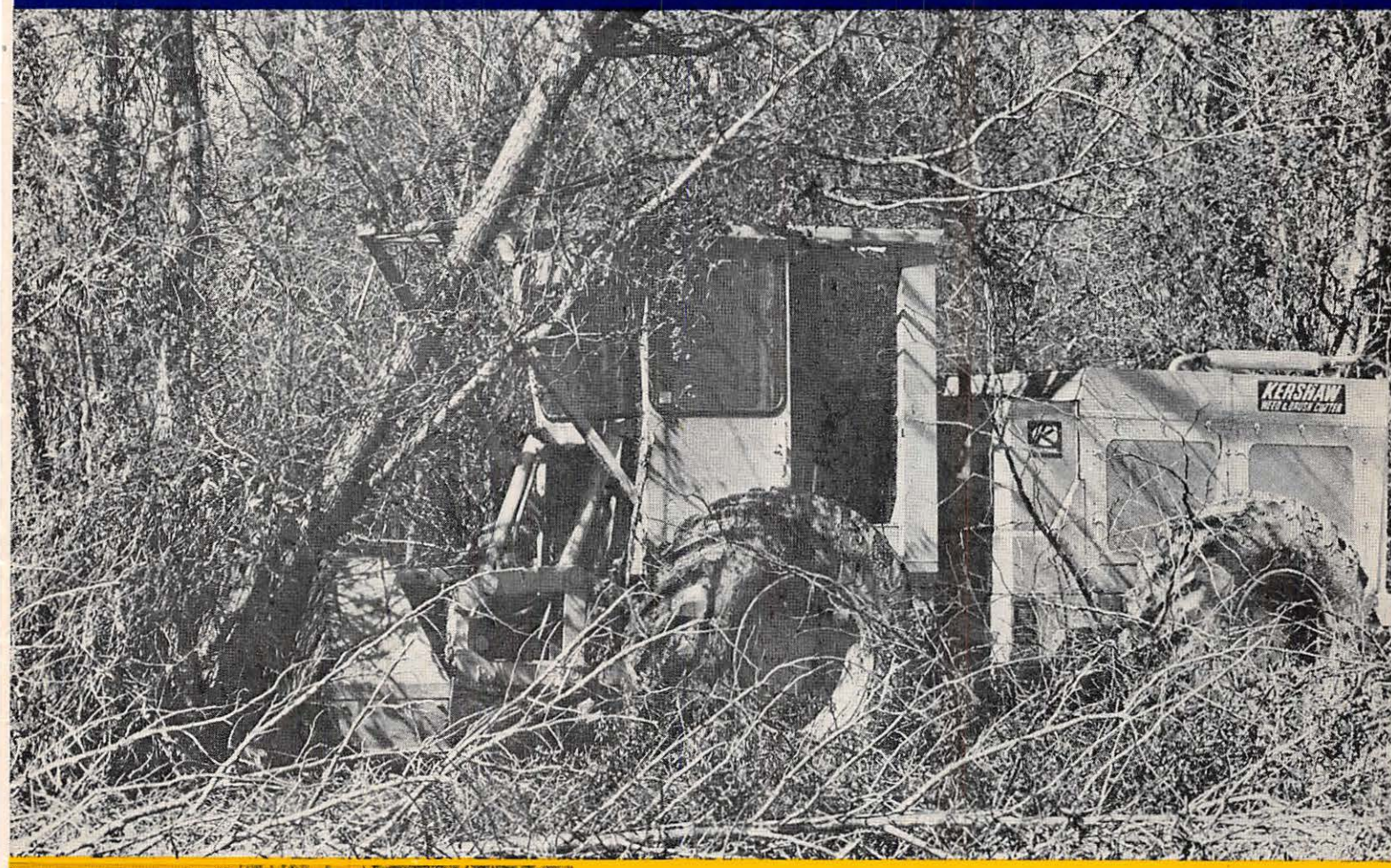
# GET THE BRUSH OUT...

## ...OF YOUR LINES...



## the KERSHAW BRUSH CUTTER

- Designed to cut brush under your communications lines over the roughest terrain.
- Constant cutter RPM and variable propelling speed with one engine made possible by use of hydrostatic drive.
- Center articulation and oscillation provides maneuverability and ground contact over rough terrain.
- Transportable over the highway under its own power or on truck.

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KERSHAW®

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# Let V/I* be your umbrella.

You know what can happen when moisture gets into railroad communications cable. Circuits fail. Schedules go out the window. Shipments are lost. You know the rest.

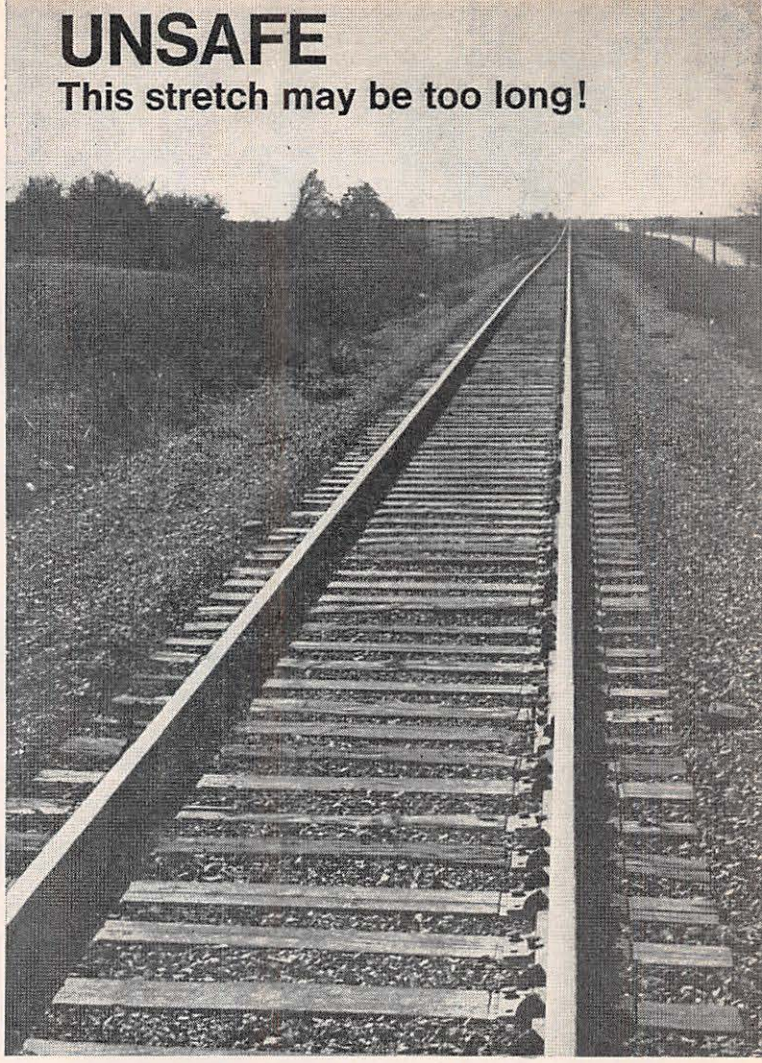
General Cable's new V/I (Vapor Impervious) communications cable construction is designed to avoid all that.

A thin metallic barrier acts as the moisture shield without significantly adding to the weight or diameter of the cable. The barrier is supported and protected by layers of special polyethylenes on both sides. The entire V/I component is formed about the cable core with the edge heat-and-pressure sealed along its entire length. It is available on both Qualpeth and Stalpeth types.

If you'd like to find out more about General Cable's V/I cable, contact us. It just might help you keep things running smoothly. Write to: General Cable Corporation, Section 600-25, 730 Third Avenue, New York, N.Y. 10017.

General Cable

*V/I is General Cable Corporation's trademark for its Vapor Impervious communications cable. U.S. Patent 3,206,541.




# Our new rail-mounted SERVOSAFE® Hot Box Detective™ prevents axle burn-offs and derailments.

## It's a good thing to have on your railroad.

## But, for safety's sake, don't stretch a good thing!

Do you have long stretches of track without SERVOSAFE protection?

Recent studies have revealed that such factors as heavier car loadings, faster train speeds and greater accelerations have combined to increase the incidence of overheated journal boxes. This has prompted many railroads to review their spacing of hot box detectors. Up to now, the average spacing has been 25 to 30 miles apart along line-of-road. Under today's conditions, however, a hot box can develop in less than 25 miles and cause a derailment *between* detectors.

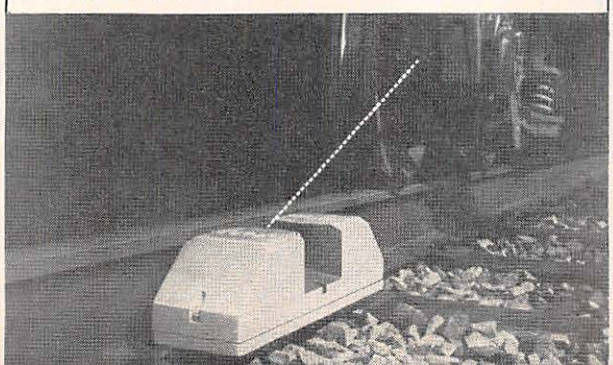
One solution becomes self-evident: closer spacing of hot box detectors for more protection. A SERVOSAFE system will not prevent a hot box—but it will detect, locate and warn of a hot box before the condition worsens into a dangerous, costly axle burn-off and derailment!

Will it cost you more to get this additional SERVOSAFE protection? Not really. Here are some reasons why not:

Our new Model 8808 SERVOSAFE system features patented rail-mounted scanners and solid state electronic data processing for the fastest, most precise detection of hot boxes. It allows remedial action to be taken *before* a failure occurs, and helps cut down the high costs of major salvage or replacement. The cost of installation and maintenance is appreciably reduced by eliminating the need for concrete foundations, special ties and expensive roadbed preparation. The rail-mounted scanner can be easily removed for maintenance or relocation. Finally, compare the cost of a SERVOSAFE with the $200,000 involved in just one derailment that could be prevented.

That's why most prudent, progressive railroad managements agree when we say, "More SERVOSAFE protection isn't costly—*lack of it is!*"

**Model 8808 SERVOSAFE Hot Box Detective** Rail-mounted scanner "looks" at journal bearing behind truck frame with a vertical, close-in target scan for greater uniformity and accuracy. Scanner is securely clamped to the rail (no drilling required). Accuracy is not affected by rail pumping, running or lateral movement.



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***Serving Safety Through Science***

*Since 1957, more than 1,000 SERVOSAFE Hot Box Detective systems have been put into service on 54 of the world's major railroads, and have compiled an unequaled record of safety improvement and cost reduction.*

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# "Max, give me 6 reasons why National is so popular."

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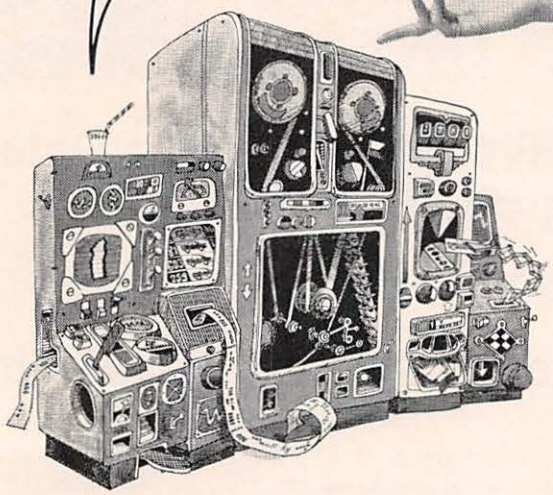
OLDSMOBILE, BUICK, CADILLAC
AND YOU.



Max, our computer, knows a sure thing when he sees it. When he found out over 50% of Americans prefer GM cars, he made sure we had a bunch. And he knows where every one is, every minute. That's why Max doesn't just make reservations, he *guarantees* them.

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# UCAR "6-PACK"

## *new source of multi-purpose power!*

**Union Carbide's "Ucar" "Air Cell" primary batteries are a new concept in premium performance from a proven power source.**

The air-depolarized Ucar battery stands unchallenged —with no comparable units commercially available today!

Utilizing the dependable carbon-zinc-caustic system, the Ucar "6-Pack" has been engineered to set completely new standards of operating flexibility, reliability and power capacity.

Any of the six different batteries is available *individually*—to provide power capabilities to meet the expanding variety of applications in signaling, communications, transportation and maritime lighting. Bonnets are color-coded blue for parallel connections—red for series connections. Here are the ratings for the batteries in the Ucar "6-Pack":

| TYPE | CIRCUIT | VOLTAGE | AMPERE-HOUR |
|---|---|---|---|
| 2P30 | Parallel | 1.25 | 3000 |
| 2P20 | Parallel | 1.25 | 2000 |
| 3P30 | Parallel | 1.25 | 3000 |
| 2S15 | Series | 2.50 | 1500 |
| 2S10 | Series | 2.50 | 1000 |
| 3S10 | Series | 3.75 | 1000 |

One big reason for more power in the same size case is micro-milled lime—Union Carbide's unique battery ingredient. Up to 65 per cent greater power density than any available unit has been made possible by its use.

Ucar "6-Pack" batteries are shipped two ways: preactivated and ready to go—or accompanied by bottled liquid electrolyte for later activation.

Check the Ucar "6-Pack". Full information on this new source of packaged, instantaneous multi-purpose power is available in special Catalog Sections. For copies, write: Union Carbide Corporation, Carbon Products Division, 270 Park Avenue, New York 10017. Export: International Department, New York. In Canada: Union Carbide Canada Limited, Toronto.

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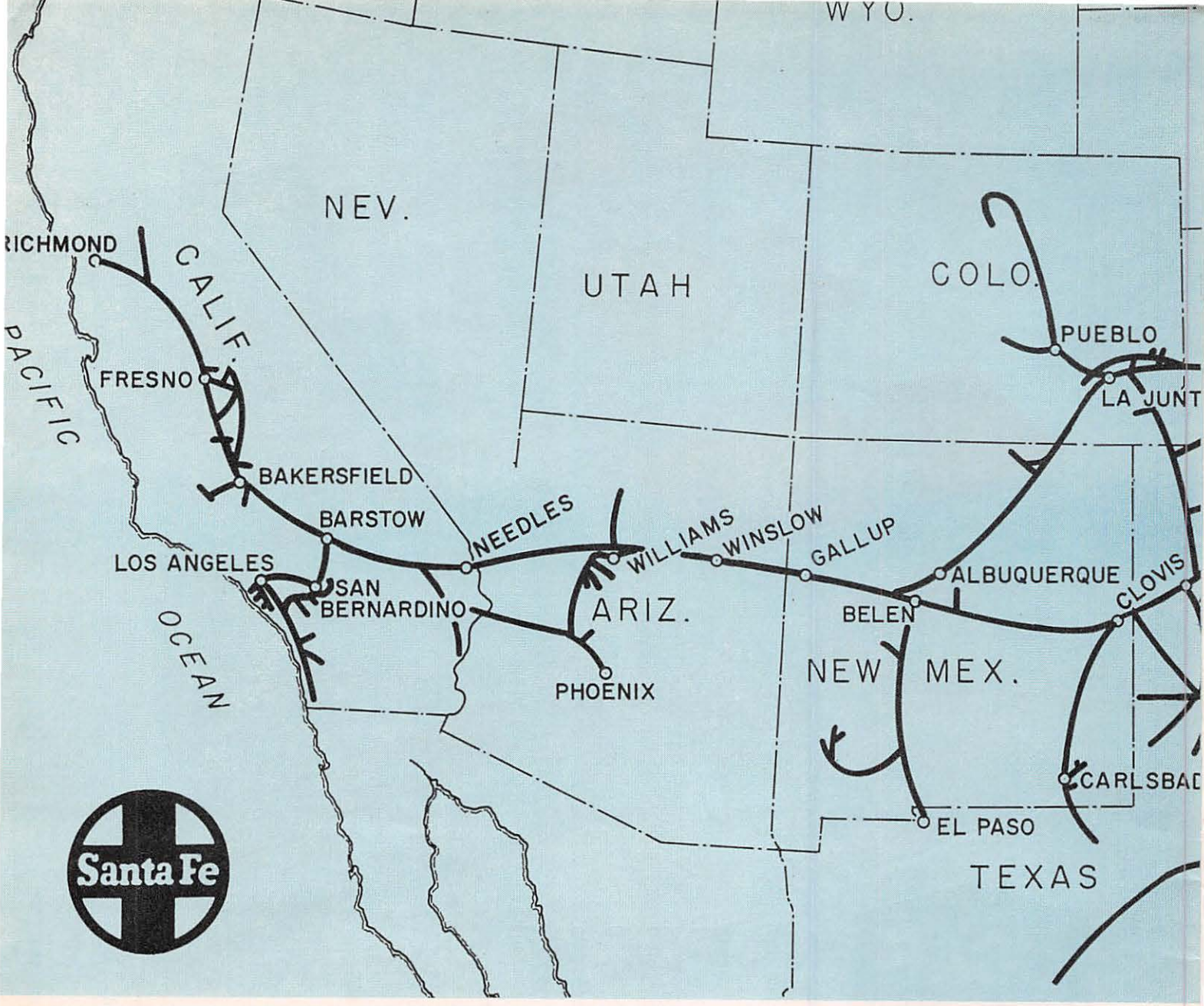
Circle 16 on reader service card




**COMMUNICATIONS SHOPS AT 38 LOCATIONS** along Santa Fe's 13,000 miles of line serve as maintenance centers for over 10,000

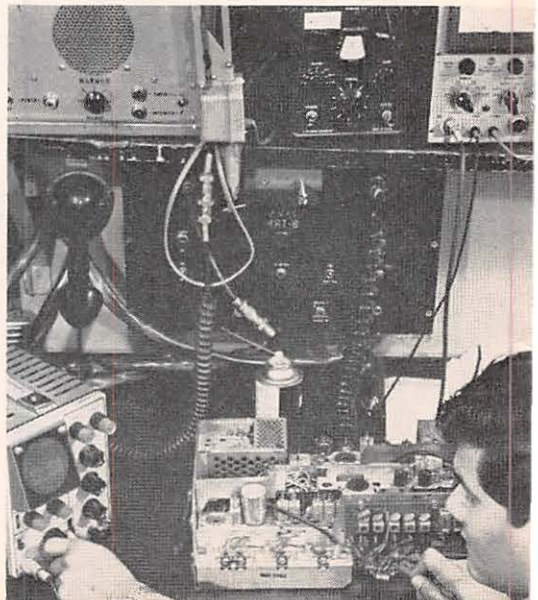
# Santa Fe finds a better way for

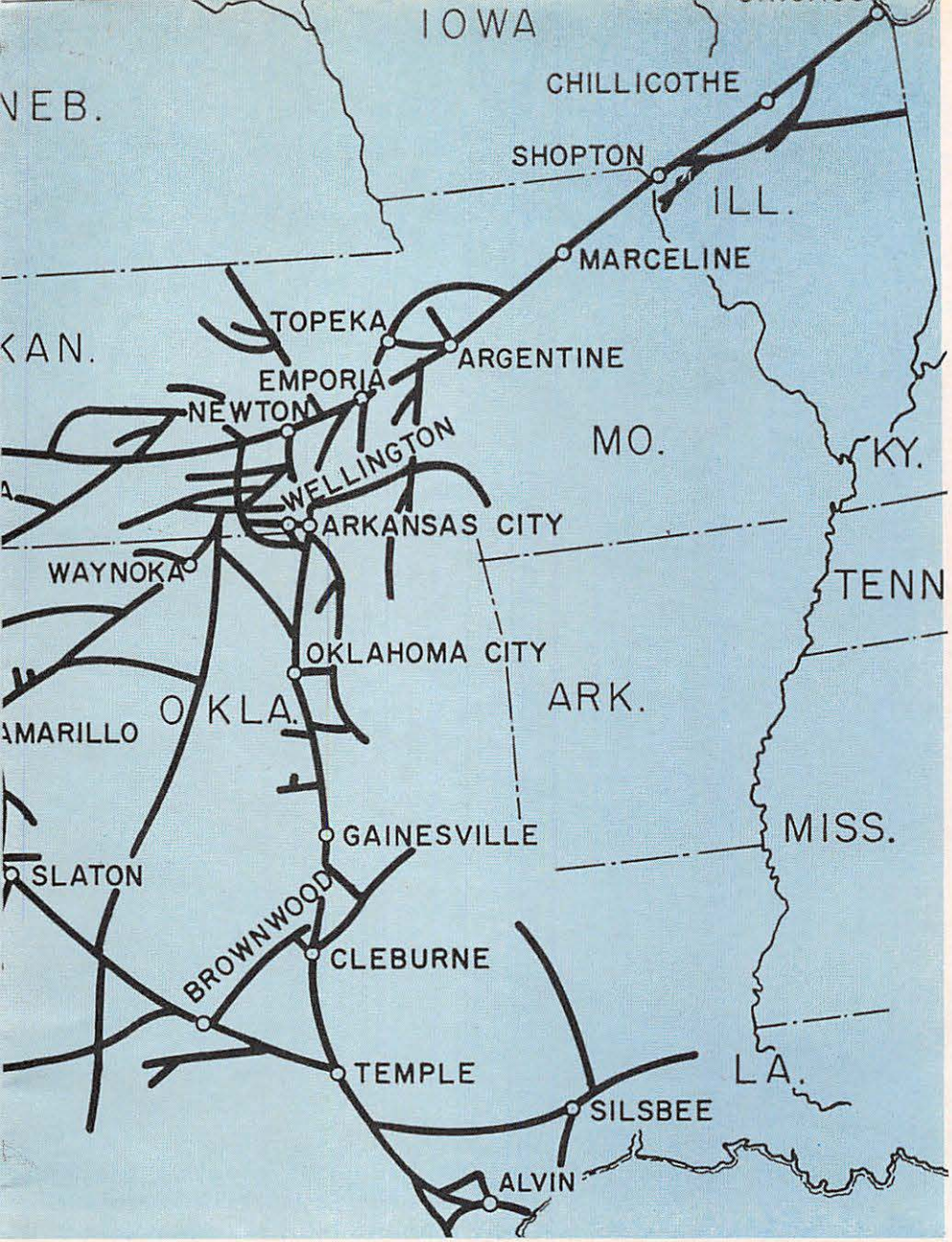
To provide meaning to the "*moving part* of your distribution arm," Santa Fe relies upon dependable communications. "If you can't communicate, you can't move trains," has been a railroad axiom ever since the first telegraphic train order was delivered in 1851 on the Erie. Since that day, railroads have depended upon communications to keep trains moving, and Santa Fe is no exception.

Such communications links as telephones, microwave, teletypewriters, train-to-wayside and end-to-end radio are key elements in keeping Santa Fe's trains on schedule, including Super C on its 40-hour, Chicago-Los Angeles run, day after day. To keep the communications equipment and systems working is a strong team of trained, experienced men using sophisticated, reliable test and maintenance equipment. Working in shops at 38 points across Santa Fe's 13,000-mile system from Chicago to the Pacific Coast and the Gulf of Mexico, these communications maintenance personnel are responsible for the dependable and often continuous operation of communications equipment that ranges from the simple battery telephone or loudspeaker system to sophisticated data terminals used in Santa Fe's data transmission network linking key yards and offices to its computer complex at Topeka, Kan.

The various communications equipments used by Santa Fe include:

**RADIO UNIT IS CHECKED** at shop.






units of equipment maintained by about 100 men.

RAILWAY SYSTEM CONTROLS

## MANAGEMENT INFORMATION

Communications maintenance involves more than just repairing a TV set or a telephone. On a railroad, it's a full-time job, and a big one. For example, Santa Fe has some 10,000 units of communications equipment scattered over 13,000 miles of line. About 100 men are employed to maintain these units that range from a loudspeaker in a yard to a complex data terminal or microwave station.

Heart of Santa Fe's maintenance operation is a system of communications shops located at 38 strategic points along the railroad. Depending upon the workload, each shop is manned on a basis of one man for one trick, 5 days per week, to several men around the clock.

As might be expected, the communications maintenance organization is most essential to keep the railroad operating, and at peak efficiency. Two-way radio, a vital tool for railroad operations, involves over 4,400 sets including base stations' mobile units and packsets in Santa Fe's daily operations.

# communications maintenance

—Radio, both fixed stations and portable units (packsets).

—Microwave, both terminals and repeaters.

—Private automatic exchange telephone equipment.

—Radio remote control equipment for operation of diesel-electric helper locomotives.

—Data transmission terminals and data modems.

—Facsimile equipment.

—Yard loudspeaker systems.

—Carrier systems operating on wire lines (up to 160 kHz).

—Closed circuit television used in yards.

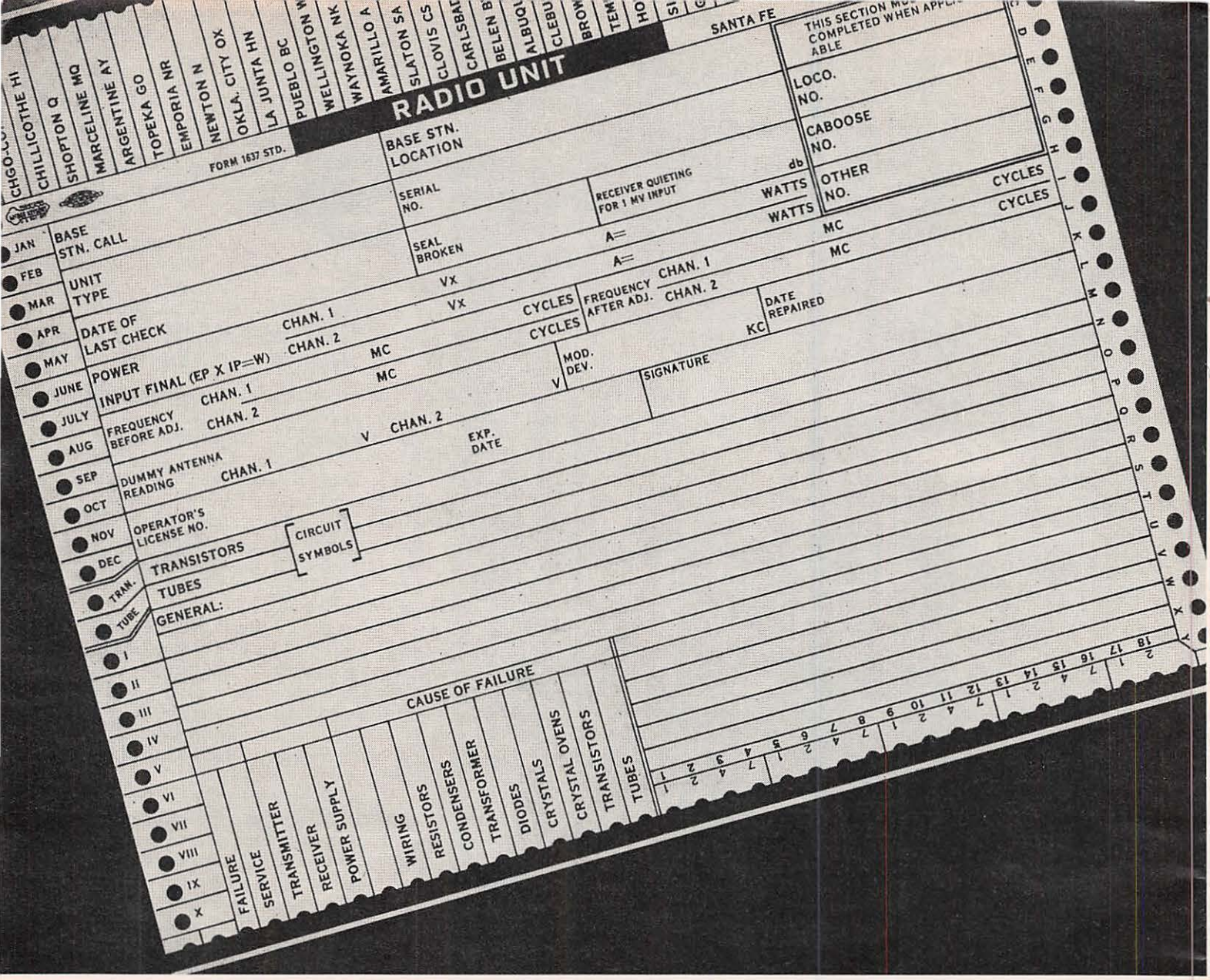
—Public address, radio and music systems in stations and aboard passenger trains.

—Automatic car identification systems.

"Our objective is to provide communications service at minimum cost with maximum utilization of manpower and equipment. About 100 men are maintaining approximately 10,000 units of communications equipment. And each man may, during his tour of duty, test or maintain equipment ranging from the simplest device to a complex system, such as a microwave repeater station. We are operating at a pretty high efficiency ratio," says L. R. Thomas, general superintendent communications and signals.

As might be expected, railroad communications is evolutionary, not revolutionary. However, since the end of World War II, there has been a tremendous increase in the rate of developments in electronic technology. This has been most prominent in manufacturing —use of transistors, and now of integrated circuits—but it has had an important impact upon maintenance. Today, the most evident result is that Santa Fe's communications shops are equipped with sophisticated test and maintenance equipment, and are manned by well-trained, experienced personnel.

Because of the economics involved, Santa Fe's communications equipment includes a wide variety of types and really represents a panorama of electronic technology over the last 20 years.




**COMMUNICATIONS SHOPS USE EDGE-PUNCHED CARD** for maintaining records on radio equipment.

Communications units range from vacuum tube sets to packsets using integrated circuits. The Barstow communications shop, for example, (cover pic), is faced with a complexity and sophistication of maintenance problems. Men must be able to maintain and repair equipment with various degrees of complexity.

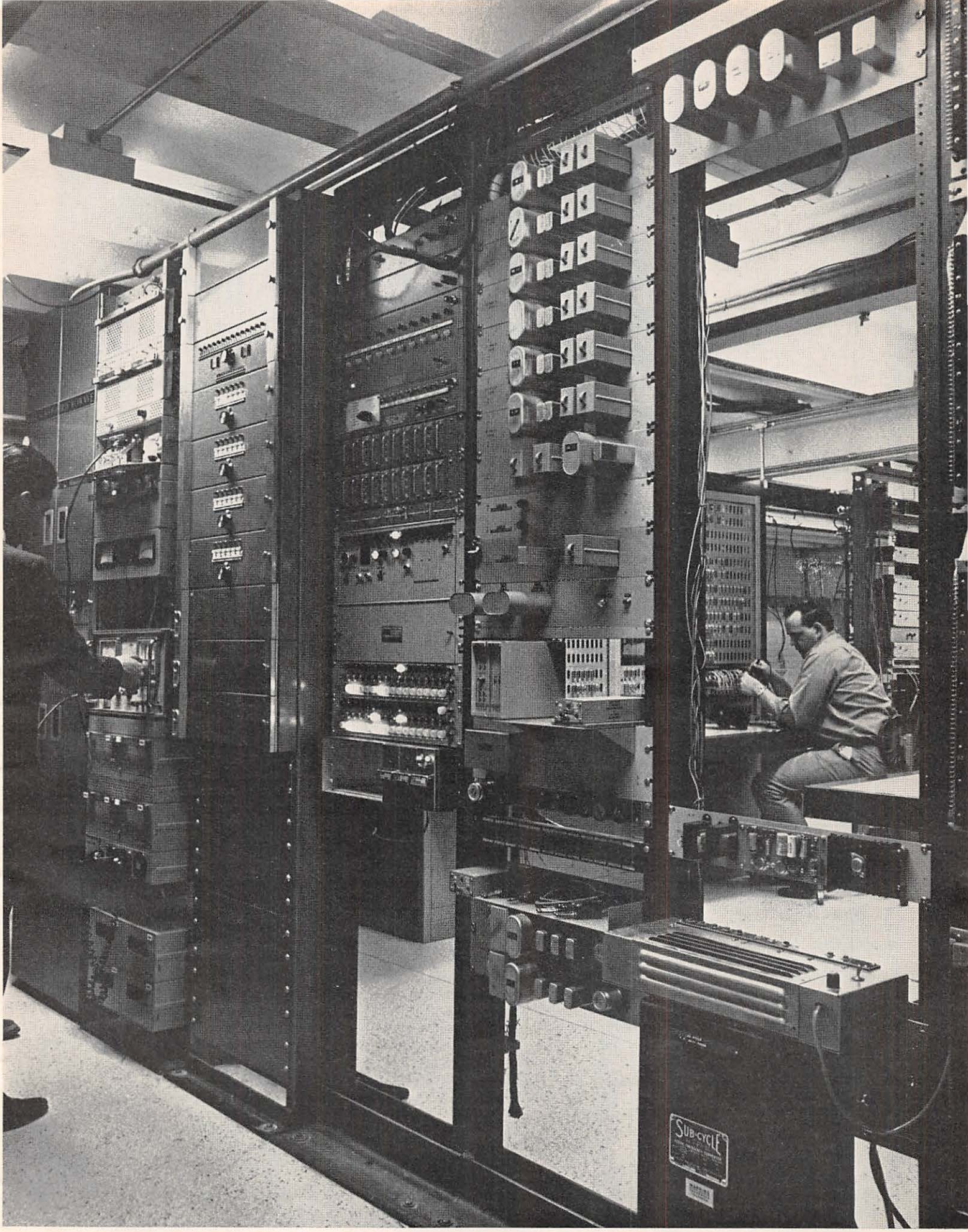
Santa Fe has kept its men up to date by making financial aid available for job-oriented correspondence courses they have taken from electronic trade schools. Many of these courses are oriented toward transistor fundamentals including operations and maintenance techniques to deal with newer equipment using semiconductor devices. Also, the railroad has sponsored courses for men within a particular class of work performed.

Also, maintenance men have been sent to manufacturers' schools to obtain knowledge about new equipment operation, and maintenance techniques associated with such equipment. "To maintain transistorized equipment, men must have a specialized knowledge, and this means an ever increasing need for training of personnel," says H. L. Massie, assistant superintendent of communications.

Santa Fe has several communications installation and maintenance positions. These include special electronic technician, licensed electronic technician, non-licensed technician, technician, division linemen and linemen. Positions of licensed electronic technician and special electronic technician require a Federal Communications Commission radio-telephone license. The special electronic technician position requires a higher degree of technical ability and knowledge than does the licensed electronic technician position.

It is not unusual for men to be taking correspondence courses to gain greater knowledge to qualify for positions requiring higher ratings. Even the top rated men are continuing their education, often studying courses in specialized areas such as microwave, high-speed data transmission or integrated circuit operation and maintenance. New, more complex and highly sophisticated data terminals must be mastered, as far as maintenance is concerned. "This installation of new equipment, especially with the rapid increases in technology, has put stresses on maintenance forces never before experienced," reports C. A. Crouch, superintendent communications, system.

Rapid advances in technology—newer models coming out at very frequent intervals—create a maintenance problem not encountered where progress is much slower and new equipment is introduced very infrequently, say Crouch and Massie. The problem now is that components often have a fairly high infant mortality rate. Maintenance personnel are under pressure to make




**COMMUNICATIONS TEST CENTER** at Topeka, Kan., is part of Santa Fe's teleprocessing network.

**CARRYALL-TYPE VEHICLE** is used by electronic technicians to carry test and replacement units to field sites.

the new equipment operate satisfactorily. After the initial shakedown period, these newer components usually require substantially less maintenance. This creates the situation that when these components do fail later on, there has been such a lapse of time between failures, that technicians have difficulty in readily recalling how they solved the problem when it originally faced them.

Another aspect of this situation is that with the very frequent introduction of new equipment, it is difficult to obtain initial reliability figures on performance. Just about the time it appears that maintenance records will indicate what a unit's operational performance will be, new components will be introduced by the manufacturer so that the unit's performance characteristics are changed.

All this is not to say that railroads want to go back to the "old days" when electronic progress was less rapid, but it does point up the constant pressure placed upon maintenance personnel to keep up to date.

A sampling of Santa Fe communications equipment provides some clue as to the magnitude of its maintenance situation:

—Over 300 VHF base radio stations.

—Approximately 1,600 locomotives equipped with radio.

—Approximately 600 cabooses equipped with radio units.

—Approximately 500 highway vehicles are radio equipped.

—Approximately 400 miscellaneous units such as track motor cars and maintenance-of-way equipment have radio sets.

—A total of 26 radio units for remote control of helper locomotives.

—Portable radios or packsets totaling about 1,000.

—Privately-owned automatic telephone exchanges total 27.

—Over 500 data and teletypewriter terminals with associated modems.

—Microwave terminals and/or repeaters located at 125 sites along a 3,200-mile microwave system.

Santa Fe has communications shops at 38 points along its 13,000 miles of railroad. Manning of these shops ranges from one man for one trick, 5 days per week to several technicians on duty 24 hours daily, 7 days per week. The amount of manpower at a particular shop is based upon the workload. The location of the communications shop is based upon workload and geography. The latter plays an important role in that time for travel to base stations, microwave sites, telephone exchanges, teleprinter locations, etc., is important. For some remote locations, for example, where few train radio sets are involved, they may be replaced on the rolling stock by mechanical department personnel.

A listing of the test equipment used at the Barstow communications shop, for example, indicates the wide range of test units available and required to maintain Santa Fe's communications equipment in proper operating condition. Additionally, Santa Fe has some highly sophisticated test equipment to check on the operation of its microwave system. Included is an RF power meter, impulse noise counter, white noise generator, white noise receiver and microwave link analyzer. Also, a set of "standards" equipment is maintained at the Topeka communications shop for calibrating test equipment. Thus, Santa Fe is assured that maintenance personnel have meters, generators and other measuring or signal producing test equipment that are accurate.

Electronic technicians have use of special highway vehicles of the "Carryall" type. They are equipped with 2- or 4-wheel drive, depending upon the terrain over which they are operated. The communications maintenance man is able to carry all the test and replacement equipment he needs for the particular job at hand.

When radio units come into a communications shop, they are given a

**AUTOMATIC CAR IDENTIFICATION** installed at Winslow, Ariz., is one of many new electronic systems.

complete check and brought up to first class condition. Although the FCC requires a frequency check once a year, Santa Fe routes all radio sets through a shop every five months. This practice is for preventive maintenance, and has worked out very well. Of course, if a set fails, it is immediately sent to a communications shop for repair, a complete check for satisfactory operation and its next maintenance date set forward.

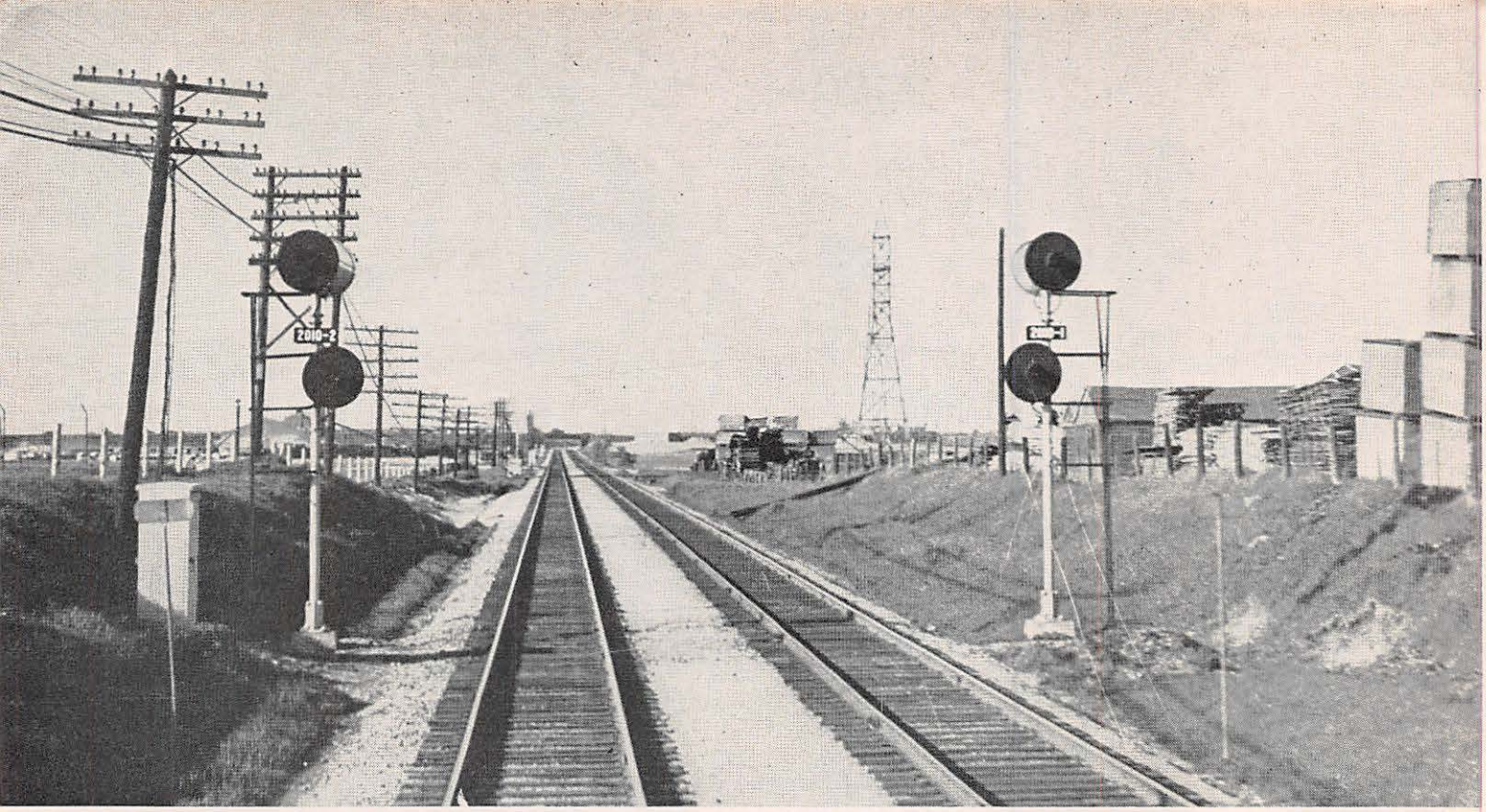
For record keeping purposes, Santa Fe uses an edge-punched card which contains information concerning the radio units. These cards are filled out by the technician working on the unit. The original is forwarded to communications department headquarters in Chicago. Also, copies are sent to the superintendent communications of the grand divisions at Topeka, Kan., Amarillo, Tex., and Los Angeles, Calif. A copy is maintained at the communications shop.

Coding by Chicago communications department personnel in the form of edge punching makes it easy to process the information. Cards can be easily pulled for frequency checks of radio sets, and for determining trends in maintenance and failures.

Each month a listing of those radio units due for frequency checks is sent to all communications shops. The information supplied to the shops includes unit type (indicates tube or transistor set), serial number, last serviced (location and date). Also included is the date due for service checking if the set has not been shopped for 5 or 10 months.

## Communications shop test equipment at Barstow, Calif.

- Fixed frequency and deviation monitor
- Portable frequency and deviation monitor
- UHF and VHF FM signal generator (adjustable)
- IF generator
- Crystal-controlled RF peaking generator
- Vacuum-tube voltmeter (AC powered)
- Vacuum-tube voltmeter (battery powered) portable
- Volt-ohm-milliammeter
- Solid-state DC multimeter with RF probe
- 2-amp, 18-volt DC adjustable voltage regulated power supply
- 30-amp, 12-volt DC adjustable power supply with ripple filter
- Adjustable 72-volt DC, 10-amp power supply
- Pakset battery tester
- Pakset test jig
- Thruline wattmeter
- Dual trace oscilloscope
- Vacuum tube tester
- Transistor tester
- Dummy antenna load
- Audio test oscillator
- Adjustable audio oscillator
- 10 mHz AC VTVM
- Frequency selective AC vacuum tube voltmeter
- Frequency counter
- Remote locomotive control lamp monitor
- Microwave test set with deviation calibrator



**PROPOSED SIGNAL RULE CHANGE** would allow installation of signals to left of track without relief from rules.

# Change proposed for signal rule

The RS&I Section 236.21 concerned with the location of roadway signals has been amended following a hearing before Federal Railroad Administration examiner Robert R. Boyd. The amended rule would lift the prohibition against left-hand signals, and only require that each signal be so located that it can readily be associated with the track on which it governs movements. The amendment was to be effective May 18, however, the order placing it in effect was stayed by the Railroad Safety Board.

The following is abstracted from the FRA docket.

By notice of proposed rule making dated January 29, 1970, the public was informed that the Federal Railroad Administration has under consideration an amendment to section 236.21 of the Rules, Standards and Instructions for Signal Systems, 49 C.F.R. 236. The proposed amendment, as set forth in the notice, is as follows:

**Section 236.21 Location of roadway signals.** *Each roadway signal must be positioned and aligned so that: (a) The indications it displays are clearly associated with the track it governs; and (b) the maximum unobstructed preview is provided to approaching trains.*

The notice invited interested parties to file comments and comments have been received.

**Section 236.21 now reads:** *Each roadway signal hereafter installed shall be located over or to the right of the track it governs.*

The fact that the current rule prohibits the location of wayside signals to the left of the track governed has prompted it to be frequently termed the left-hand signal rule. As a matter of fact, however, many exemptions from the rule have been granted over the years and there are numerous wayside signals already located to the left of the track governed. As was pointed out in the notice of proposed rule making, in 1969 the Railroad Safety Board granted 42 out of 43 left-hand signal applications. The ratio of grants to denials of this type of application has probably been about the same for many years past.

*Brotherhood of Locomotive Engineers and Brotherhood of Railroad Signalmen:* The BLE and the BRS submit that the proposed amendment would lead to unsafe operating conditions and subject operating employees and the traveling public to unnecessary hazards. They also contend that the criteria, namely, (1) clearly associated with the track governed, and (2) maximum unobstructed preview, are ambiguous, and, therefore, are subject to misapplication by the railroads. They further urge that track curvature, adverse visibility due to weather conditions, operation of locomotive long-end forward and single man operation necessitate the placing of signals over or to the right of the track governed. The fact that the present rule necessitates the filing of a petition for relief and allows all parties the opportunity to examine the particular merits of each case, is considered a desirable procedure by these Brotherhoods. They oppose adoption of the considered amendment.

*Association of American Railroads:* The AAR supports the proposed rule in part. It concedes that the purpose of the proposal, to eliminate the necessity for the filing and processing of applications whenever a signal is to be located on the left-hand side of the tracks, is altogether desirable. It points out that the existing rule, which requires signals to be located to the right of or above the tracks governed, has necessitated the filing of more applications for relief than any other signal rule and that in almost all such cases relief has been granted; but only after delay averaging three to four months and the performance of considerable paper work on the part of both the railroads and the Federal Railroad Administration.

The AAR considers, however, that the amendment suggested by the FRA is in several respects unclear and im-

practical, and submits that the desirable purpose which underlies the proposal could better be achieved by amending the existing rule so that it would read as follows:

*Each roadway signal shall be located so that it can be readily associated with the track on which it governs movements.*

Allegedly this change would permit location of signals to the left of tracks without paperwork or delay and would maintain the safety of operations since no left-hand location would be lawful unless the signal could be "readily associated" with the track it governed. This phraseology has been recommended by the appropriate committees of the AAR after careful consideration of the problem.

The AAR states its specific objections to the proposed rule essentially as follows:

(1) The existing rule (Section 236.21) is a signal location rule, but the FRA proposed revision speaks of alignment and preview in addition to location. Alignment and preview are matters altogether different from location; and experience has not indicated any need for expanding the scope of this rule to include provisions relating to alignment and preview. Such inclusion would in itself create confusion.

(2) "The maximum unobstructed preview" required by part (b) of FRA's proposal is inherently not susceptible to precise definition. Determining what is maximum unobstructed preview in any of thousands of special circumstances would be subject to endless and fruitless argument. The same would be true if some other phrase such as "adequate unobstructed preview" or "sufficient unobstructed preview" were substituted. In addition the proposal as written would extend to existing signals, as well as those hereafter installed, and would call into question the technical legality of thousands of signals which, as now located, have served safely and well for years.

(3) Finally, a requirement for maximum unobstructed preview or comparable language could force the installation of left-hand signals in areas where there are compelling operational or other reasons for use of right-hand signals.

(4) In the judgment of the AAR, the published proposal would increase rather than decrease the number of applications for relief.

*Penn Central Transportation Company:* Penn Central agrees that the present rule should be modified so as to permit left-hand signal installations, but contends that the language of the proposed rule is objectionable. It argues that the proposal uses terms which no two people are likely to interpret in the same way; that inherent in the words "positioned and aligned" is a question of distance—longitudinal, vertical or horizontal—which can create confusion and uncertainty, and that the word "maximum" connotes a preview of immeasurable, unbounded and infinite distance, and is susceptible of misinterpretation; that such a standard would be impossible to apply or enforce; and that safety would not be enhanced by the greatest possible preview of a signal nor be impaired by a preview somewhat less than the greatest possible. Affirmatively, the Penn Central urges that the rule be worded as recommended by the AAR, quoted above.

*Union Pacific Railroad Company:* The UP generally supports the proposed rule as published. It points out that the location of a signal on the left sometimes increases preview of the signal, and that in many cases it is not economical to locate the signal on the right. It sees among the benefits of installing signals on the left-hand side, savings in the elimination of costly signal bridges, in the installation of additional cable and foundations, and in realignment of tracks to get proper track centers. Affirmatively and constructively it urges, if the proposed rule change is approved, that all railroads continue to use extreme care in future installations of left-hand signals; that applications should be limited to tangent track, if possible, except in cases where there is a distinct advantage of an earlier preview of signals when located on curves; and that caution be used in locating left-hand signals in congested areas where there is a chance of confusion and the possibility of an engineer accepting a signal that was not intended for his train.

*DISCUSSION AND FINDINGS:* The proposed amendment has two parts. The Brotherhoods oppose the amendment as to both parts and indicate general opposition to left-hand signals. The AAR and one individual railroad participating basically support part (a) but object strongly to part (b). The requirement, that a roadway signal be located so that it can be readily associated with the track governed, is rather obviously meritorious.

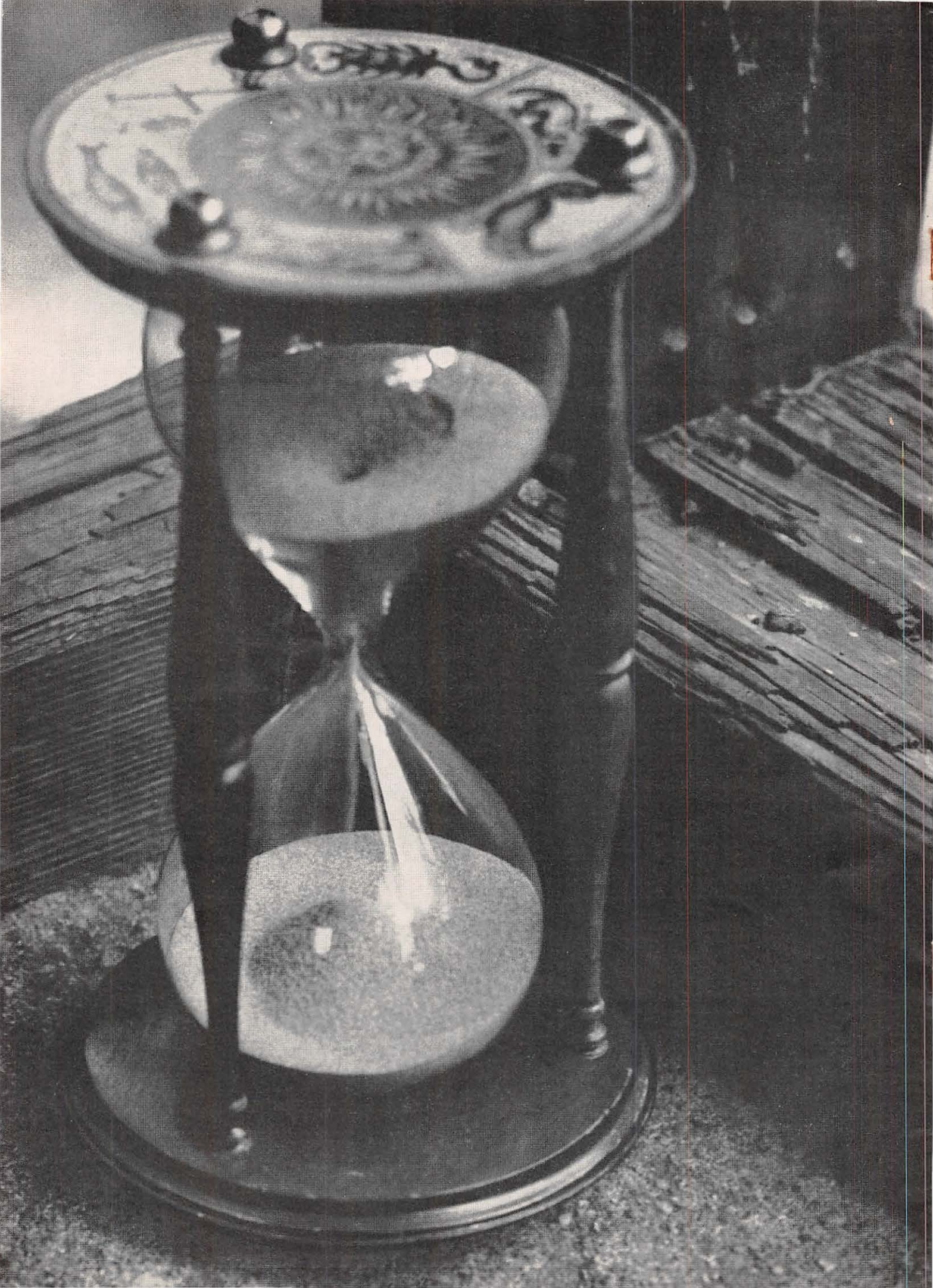
As to the semantics of the proposed rule, it should be recognized that almost any wording used in drafting the rule might be subject to some misinterpretation or some variety of meaning to different people. Even part (a) which is not objected to as a minimum requirement is something that reasonable men may differ on when they actually assess the location of a certain signal. In other words, there may be instances when it will be arguable as to whether a certain signal can be readily or clearly associated with the track governed. There is no need to labor the semantics further. The approach here is, one, determine the intended purpose of the proposed rule, and, two, word the rule so as to accomplish that purpose with as much clarity as is possible under the susceptibleness and frailities of the English language.

As seen, the only purpose of the existing rule 236.21 was to prohibit left-hand signals. It would follow from that, and the total informal record supports this conclusion, that the only purpose of the contemplated amendment is to allow left-hand signals provided they can be readily associated with the track governed. The preview of the signal was not a purpose of the existing rule; there is no existing rule, other than the spacing rule 236.24 regarding the preview of signals; and to now insert a preview requirement heavily weighted on distance would certainly exceed the

## MANAGEMENT INFORMATION

It has been proposed to change the rule governing the location of roadway signals to permit installation to the left of the track governed by the signal. Federal Railroad Administration's Railroad Safety Board granted 42 out of 43 left-hand signal applications in 1969. Relief has usually been granted because of the increased visibility provided to an engineman from the cab of diesel locomotives. The present rule requires that signals be installed over or to the right of the track governed.

As noted in the photograph of a double-track line with reverse signaling, enginemen have a clear view of signals. Also, signals mounted to the left of the track they govern eliminates construction of a bridge-type overhead structure.



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basic purpose of the original rule and, as pointed out by the railroad parties, would add a distinctly different second dimension to the signal location requirement.

As to the opposition by the Brotherhoods, it is especially recognized that the employees represented by the Brotherhood of Locomotive Engineers have a vital interest in railroad safety as they are personally in the forefront of all train movements, and not only have the responsibility for signal compliance and safe train movement, but stand personally in a dangerous position should signals not be seen or complied with. The answer, however, is that the mere location of a signal on the left, instead of the right, has not been shown to bear any adverse relationship to safety or signal compliance over the many years in which thousands of signals have existed to the left.

It is concluded that for the limited purposes of rule 236.21, the requirement of part (a) of the proposed rule is all that is needed for railroad safety. The wording proposed by the industry and that proposed by part (a) of the published rule have precisely the same meaning as seen by this examiner. The informal record indicates, however, that in earlier staff work on this subject, the expertise within the Federal Railroad Administration apparently favored wording similar to that recommended by the industry committees. In the circumstances, that wording is adopted in the rule enunciated herein.

The fact that this decision agrees with the industry as to the limited purpose of rule 236.21, does not mean that it entirely agrees with the industry position regarding the preview of wayside signals. As understood, and as the entire industry must readily concede, the minimum preview must be of sufficient measure to enable two distinct reactions by the personnel in the cab of the locomotive, namely, one, there must be time to focus upon and read the aspect of the signal—interpretation time, and, two, there must be time to call the signal and begin reaction, if called for, by the time the cab is parallel with the signal. The spacing rule and the overlap system of signaling then give the engineer sufficient distance to take required action before the next and critical signal is reached. Existing regulations do not spell out requirements regarding preview time but the basic jurisdiction exists within the Federal Railroad Administration for such a rule if it should be needed. For one signal, or generally, if the preview is a problem, the Federal Railroad Administration should be informed and appropriate corrective action may and shall be taken. Aside from semantics, the industry contention that a requirement on preview would create confusion is utterly without merit. The industry contention regarding existing signals and the implication that a problem would be created regarding the legality of existing signals is also completely beyond the point here and without merit. If there are in fact existing signals where the preview is a problem, they can and should be dealt with promptly. The non-inclusion here of a preview requirement rests solely on the conclusions (1) that it is beyond the basic purpose of section 236.21 and (2) that no need is shown on this record, or elsewhere, to warrant a preview requirement at this time and in this limited proceeding. In the event it is subsequently shown to be a problem it should be dealt with in a separate rule and a separate proceeding.

A point of practical compliance deserves comment. In the event any situation should arise under the rule herein adopted wherein, because of multiple track or otherwise, it becomes questionable whether a particular signal can be readily associated with the track governed, then the issue should be immediately referred to the Federal Railroad Administration for appropriate action. That action may include on-site evaluation of the signal by our field personnel or others and in the event it is determined that the signal is in fact not readily associated with the track governed, then an order may be entered directing relocation of the signal to the proper point. In multiple track territory, carriers might be well advised to obtain prior approval, at the field level, appealable here, before installing left-hand signals. In any event the incidental prohibition of the rule herein adopted should be repeated and emphasized, that is, that all signal locations susceptible to incorrect track association are outlawed.

*ORDER:* Premises considered, it is the order of the examiner that section 236.21 of the Rules, Standards and Instructions for Signal Systems, 49 C.F.R. 236, be amended to read as follows:

**Section 236.21 Location of Roadway Signals:** *Each roadway signal shall be located so that it can be readily associated with the track on which it governs movements.*

# FCC issues tentative decision on data firms

Federal Communications Commission has issued a tentative decision on its computer inquiry, that is, should firms providing data processing services which use communications facilities (many leased from common carriers) be regulated. The Commission said that data processing as such would not be regulated, and communications carriers could provide service through separate subsidiaries or affiliates, with various safeguards to insure segregation of operations and accounts. Bell System companies cannot have data affiliates under consent decree, but many provide data processing incidental to communications. Western Union would continue to offer SICOM and Info-Com services under tariffs.

The Commission asked for comments by May 13 in order for it to proceed with rulemaking, which it hopes can close out the 3½ year proceeding. It all began in 1966 when 60 firms and organizations filed more than 3,000 pages of comments, which were later analyzed by Stanford Research Institute.

Current estimates are that about 800 data processing service bureaus are in operation utilizing about 2,000 branch offices. Annual sales estimated at $900 million are expected to increase to $1.2 billion by 1972. Similarly, computer time-sharing, is expected to increase to about $900 million by 1972.

The following material is abstracted from *Telecommunications Reports:* The Commission's tentative conclusion was that if a service is primarily data processing, however much communications service may also be involved, it should not be regulated. This both frees data processing companies from the possi-

**DATA PROCESSING** as such would not be regulated by the Federal Communications Commission.

bility of FCC regulation, and permits all existing common carriers except the Bell System to provide predominantly data processing services through separate subsidiaries.

Common carriers would furnish data processing services only through separate corporate entities, with various safeguards to insure financial and operational segregation from the regulated communications operations, and nondiscrimination in providing communications services to all.

Ruling out the Bell System from providing data processing through separate subsidiaries was based on the 1956 antitrust consent decree, which bars the companies in general from non-regulated activities. Nonetheless, the FCC concluded that "Insofar as data processing is incidental to communications within the meaning of paragraph V(g) of the consent judgment, as well as our policy statement herein, (the American Telephone & Telegraph Co.) and its affiliated operating companies are free to furnish such a service.

"We intend to maintain a careful and continuous observation of the activities of the Bell System companies in their use and application of computer technology for both communications and administrative purposes, to the end that such companies shall not offer data processing which is not clearly incidental to communications within the meaning of the consent judgment and this policy statement."

The FCC pointed out that under the ruling, its decision regarding the status of the Western Union Telegraph Co.'s SICOM and Info-Com services as tariffed communications offerings will stand up. "Under our decision herein," it said, "Western Union would be permitted to continue to offer these services as tariffed common carrier communications services.

"However, we shall expect any changes in the SICOM or Info-Com services to be reflected in appropriate tariff revisions which shall thereupon be closely scrutinized by the Commission in order to determine whether the modifications have altered the status of these services under the Communications Act. If our examination reveals services of primarily data processing, we would require Western Union to withdraw its tariffs and provide such revised offerings through a separate corporate entity under our safeguard rules."

"Our decision herein would require tariffs for such services to be filed, since they are not hybrid offerings exempted from regulation," the FCC said. "However, if the switching services were broadened to include substantially data processing, they would be treated by the Commission in the same manner as would an altered SICOM or Info-Com service."

The Commission concluded that "the questions relating to interconnection or to the need for other improved common carrier service offerings, regulations, and practices to serve computer needs can best be handled through rate, tariff, and licensing proceedings that are now pending or that may be initiated in the future, rather than through a continuation of our industry in this docket.

"With respect to the questions which have been raised . . . regarding the adequacy of common carrier facilities and services to meet present and future communications needs of computer users, the specific nature and extent of such requirements are not clearly ascertainable from the information available to us. This is largely because computer technology and its commercial applications are developing with no fixed patterns at this time, with the result that it is most difficult to project and quantify the communications requirements of computer users . . .

"Accordingly, we intend to establish appropriate informal procedures by which such information may be re-

## MANAGEMENT INFORMATION

The relationship between data processing and communications has been under study by the Federal Communications Commission for over three years. Recently, FCC issued a tentative decision regarding the subject. Basically, FCC feels that data processing and service bureau type operations, per se, should not be regulated. And communications common carriers could provide data processing services which use communications facilities. However, the common carriers must do so through separate subsidiaries or affiliates, with various safeguards to insure segregation of operations and accounts. Bell System companies cannot have data affiliates under consent decree, but many provide data processing incidental to communications.

ceived and reviewed on a continuing and current basis by the Commission. Such procedures will be designated to afford interested parties the opportunity to participate in a discussion and evaluation of present and future communications requirements of computer users, the steps that are to be taken by carriers in order to respond to any such bona fide requirements, and the actions, if any, the Commission may be called upon to take in order to assure that the carriers are properly responsive to such requirements."

The statement referred both to tariff revisions by the established carriers aimed at meeting the requirements of the data community, and the various applications for "special service" common carriers which have been submitted since the "significant" decision in the Microwave Communications, Inc., case.

The FCC added, "It must be understood that the outstanding proposals for new common carrier services which are now pending before the Commission remain to be evaluated in accordance with applicable statutory standards and regulatory policy. It is our view, however, that all of the foregoing developments signify that since the inception of this inquiry, major progress has been made and is continuing toward improved and more economical communications services for computer users."

Policy regarding separate subsidiaries by common carriers was described as follows: "We are hereby adopting a policy that communications common carriers shall furnish data processing services only through separate corporate entities. This requirement shall be applicable to all communications common carriers engaged in interstate or foreign communications services, including connecting carriers within the meaning of section 2(b)2, 3, and 4 of the Communications Act, where any such carrier itself has annual operating revenues exceeding $1,000,000 or any such carrier is directly or indirectly controlled by or is under common control with another carrier or carriers and the combined annual operating revenues of all such carriers exceed $1,000,000.

"Each such data processing entity shall be staffed with separate officers and operating personnel, and shall use equipment and facilities devoted exclusively to the rendition of data processing and other non-common carrier services. We shall also require that the data processing affiliate maintain its own books of account and file with the Commission separate annual and other reports as may be prescribed by the Commission . . . Further, we shall require the submission by the carrier—whether the carrier be a parent or subsidiary—of all inter-corporate agreements and memoranda of any arrangements between the carrier and its affiliate.

"When such separate corporate entity obtains communications facilities or services from its affiliated common carrier—whether parent or subsidiary—it will be required to do so pursuant to the same tariff terms, conditions, and practices as are applicable to any other customer of the carriers, and specifically, on terms and conditions no more favorable than those offered to other unaffiliated entities.

"Moreover, we shall require that no carrier subject to the aforementioned conditions engage in the sale or promotion of data processing activities on behalf of its data processing affiliate. Finally, we will expect any affiliate of a common carrier to permit reasonable interconnection with facilities of the customer."

## Safeguards are implemented

The FCC observed, "It is noteworthy that, in varying degrees, the safeguards provided for above have already been implemented by the larger interstate common carrier systems. Western Union, General Telephone & Electronics, and United Utilities have organized or acquired separate affiliates for the promotion and sale of data processing services.

"We intend to conduct a full and comprehensive review of those affiliated organizations and their operations to insure that they are in full compliance with policies promulgated herein. We shall require in this regard that each such company, within 60 days from the effective date of the final decision herein, submit in writing a full description of the organization, facilities, and operations of their data processing affiliates, together with copies of all agreements and memoranda or other arrangements between carrier and affiliate.

"Other carriers, who may not have already established such arrangements to separate their communications activities from the sale of data processing services, shall do so within six months from the effective date of any rules adopted to implement this policy" (this provision obviously applies only to carriers with data processing services, and not to all of those with annual revenues over $1,000,000).

Basic to analysis of its conclusions the FCC noted, are definitions of terminology as used in its decision. It defined "data processing" as "the use of a computer for the processing of information as distinguished from circuit or message-switching. 'Processing' involves the use of the computer for operations which include the functions of storing, retrieving, sorting, merging, and calculating data, according to programmed instructions."

Definition of "message switching" was "The computer-controlled transmission of messages, between two or more points, via communications facilities, wherein the content of the message remains unaltered."

On this score, the Commission footnoted that "Message switching should be distinguished from circuit switching notwithstanding the fact that both functions involve the interconnection or transfer of electric signals from one channel to another. Historically, circuit switching, typified by the telephone industry, involves a carrier's providing it's customer with exclusive use of an open channel for direct electrical connection between two or more points . . . In effect, message switching is essentially a 'store and forward' function with respect to predetermined information; circuit switching, on the other hand, involves the establishment of a completed transmission path prior to the communication of any information.

"The computer, because of its great speed, has so reduced time delay with respect to message switching that historical distinctions in switching have become blurred. However, the role of the computer in circuit switching still remains distinct from that of a computer in message switching. Although it serves as the 'control' element in basic functions, in a circuit-switched network, the actual information flow is through a switching matrix—not the computer; in message switching, any information transmitted from terminal points must necessarily pass through and undergo some processing by the computer main frame."

Continuing with its definitions, the FCC termed "local data processing service" as "an offering of data processing wherein communications facilities are not involved in serving the customer." It listed "remote access data processing services" as "an offering of data processing wherein communications facilities, linking a central computer to remote customer terminals, provide a vehicle for the transmission of data between such computer and customer terminals."

The FCC, on the crucial definition of "hybrid service," described it as "an offering of service which combines re-

mote access data processing and message switching to form a single integrated service."

In its discussion of the "hybrid service," the Commission said it has made clear that "it is not our intention to assert direct regulatory jurisdiction over the sale of data processing whether engaged in by conventional communications common carriers or other entities, despute the employment of communications facilities to accomplish the data processing.

"When, however, data processing is combined with message switching, a different question is presented. This is because message switching is, in essence, an operation which is inherent in the process of transmitting, by wire or radio, intelligence or data from point of origin to point of destination . . . It is possible for users not only to have online communication with the computer for data processing purposes, but it is also possible for such users to have the means of communicating with each other when the computer is programmed to switching messages of one to another. Unlike data processing, however, the computer, when and if used for message switching, does not alter the content of the intelligence transmitted."

The Commission reported, "It is our position that where message switching is offered as an integral part of and as an incidental feature of a package offering that is primarily data processing, there will be total regulatory forebearance with respect to the entire service whether offered by a common carrier or non-common carrier, except to the extent that common carriers offering such a hybrid service will do so through affiliates and will be subject to regulatory safeguards.

"If, on the other hand, the package offering is oriented essentially to satisfy the communications or message switching requirements of the subscribers, and the data processing feature or function is an integral part of and incidental to message switching, the entire service will be treated as a communications service for hire, whether offered by a common carrier or non-common carrier and will be subject to regulation under the Communications Act.

"One applicable test will be whether the service, by virtue of its message switching capability, has the attributes of the point-to-point services offered by conventional communications common carriers and is, basically, a substitute therefore. Another test will be the extent to which the message switching feature of the service facilitates or is related to the data processing component, or whether such message switching is essentially independent of such data processing.

"In effect, we shall address ourselves to the facts surrounding a package offering with a view toward determining the primary thrust of the service offered. We deem it important that these distinctions be carefully applied and that the essential nature of the service as primarily data processing or communications not be artificially obscured."

In explaining its "regulatory safeguards" regarding common carriers, the FCC reported that the view that "any regulatory safeguards promulgated with respect to the sale of data processing services by communications common carriers should seek to assure:

"(a) That such services will not adversely affect the provision of efficient and economic common carrier services; (b) that the costs related to the furnishing of such services will not be passed on, directly or indirectly, to the users of common carrier services; (c) that revenues derived from common carrier services will not be used to subsidize any data processing services; and (d) that the furnishing of such services will not inhibit free and fair competition between communications common carriers and data processing companies or otherwise involve practices contrary to the policies and prohibitions of the antitrust laws."

## Rely on free enterprise

In general, the FCC observed that "In this country we rely upon the 'free enterprise' system with the maximum possible latitude for individual initiative to enter into any given enterprise and compete for the available business. Our antitrust laws are designed to prevent restraint of trade. Government intervention and regulation are limited to those areas where there is a natural monopoly, where economies of scale are of such magnitude as to dictate the need for a regulated monopoly, or where such other factors are present to require governmental intervention to protect the public interest because a potential for unfair practices exists.

"Applying these standards to the record before us, we conclude that the offering of data processing services is essentially competitive and that, except to the limited extent (provided for), there is no public interest requirement for regulation by government of such activities."

There is, the FCC said, "ample evidence that data processing services of all kinds are becoming available in larger volume and that there are no natural or economic barriers to free entry into the market for these services. The number of data processing bureaus, time-sharing systems, and specialized information services is steadily increasing and there are no indications that any of these markets are threatened with monopolization.

After reviewing the growth and diversity of data processing services in recent years, the Commission commented that "In view of all of the evidence of an effective competitive situation, we see no need to assert regulatory authority over data processing services whether or not such services employ communications facilities in order to link the terminals of the subscribers to centralized computers. We believe the market for these services will continue to burgeon and flourish best in the existing competitive environment."

In outlining the regulatory safeguards its plans to impose on common carriers' data processing affiliates, the FCC said it recognizes that "the provision of other services, and particularly data processing services, by common carriers may give rise to critical problems of unfair competition and cross-subsidy.

"In fact, one of the major concerns raised by many respondents to our notice of inquiry relates to the participation of communications common carriers in the provision of data processing services without essential protection against such unfair competition. These concerns arise from the potential of common carriers to subsidize their data processing operations with revenues and resources available from their regulated services, thereby enabling them to dominate the data processing market by underpricing their data processing services."

Regarding the question of privacy and security of data stored in computer interconnected with communication facilities, the Commission noted that this issue "in its broadest sense has numerous social and public policy implications which go well beyond the pale of our jurisdiction over communications."

Adding that of course it also has a responsibility in this area, the FCC said that as indicated in its first report in the computer inquiry, "we intend to give further consideration to the needs which may exist in this area and to the regulatory actions which may be required. We also recognize the need to obtain more information regarding present and future needs and the technical, operational, and economic implications, as a basis for such further consideration."

**DIGITAL COMPUTER CONTROLS YARD** on Santa Fe at Argentine, Kan.

# Cybernetics

The computer is a tool that will be used extensively by rail managements in the decades ahead. By 1980, real-time, data processing systems will be widely used on American railroads. What will make a difference is the wide range of activities handled by computers and the new breed of managers who will effectively use this powerful data handling tool. Herewith are abstracts of two of the many papers presented at a recent symposium.

The outlook for the eighties was the subject of a paper by Illinois Central President Alan S. Boyd presented at the Third International Symposium on Cybernetics held in Tokyo, Japan, April 12-17, 1970. Excerpts from his paper follow:

By 1980 on-line or real-time computer operations will be commonplace on U.S. railroads. Automatic inputs to computers will stimulate automatic feedbacks, which, in turn, will trigger other responses. With such systems, human intervention is minimized, but the human interface at either input or output achieves major importance to the whole operation.

Trains will move over entire systems controlled completely by computers. Computers will dispatch trains, arrange meets, control headway between trains, stop and start trains as necessary. For reasons of safety, there will be a man in the locomotive cab, but his principal duty will be to override automatic controls in case of emergency or equipment failures.

Computer control of trains will bring operational control centers; visual displays will indicate the location and composition of all trains. Such control centers will be able to display variable data on request. Such data might include cars of a given type in any yard in the system, cars for specific destinations situated in a given yard, cars detained in terminals in excess of present standards, and so forth.

Automatic car identification systems will put accurate consists or manifests of trains in computers in real time as trains move over the line. Computerized exchange of data between railroads will reach a stage where only originating roads will submit to the central computer full data on shipments. The central computer will provide such data to connecting carriers.

By 1980, major railroads will have a most valuable tool in the area of operations. This will be a simulator. It will be

# expands into many rail areas

a complete rail system, using network analysis. It will help us get a grip on questions for which we now have no definitive answers. For example: Should we run shorter trains more frequently, or longer trains less frequently? Do we need more passing tracks? If so, where and how long should they be? Is there a need for a marshalling yard? If so, where? What type? What capacity? What will it do for us? It takes a computer, and a large one at that, to analyze these problems. Network analysis also quantifies costs so that financial consequences of alternative actions can be evaluated.

Illinois Central has worked on a cost-profit calculator. Essentially, it is a two-part system, the first part being a calculator and the second a simulator. The calculator uses the computer to record actual or theoretical moves that take place on the railroad, allocates to that movement appropriate elements of cost, compares the costs with revenue, and determines profitability. Varying aspects of costs are used in the calculations such as out-of-pocket, fully distributed, and so forth. When all this is completed, we are able to determine the most profitable and the least profitable movements based on various criteria.

The second part of the system is an even more sophisticated tool: a simulator. This capability will make it possible for us to determine the various categories and the kinds of costs involved in hypothetical moves. We will be able to tell the computer the commodity carried, type of car, route to be traversed, and other variables and have the computer give us the costs associated with such movement. Ready access to such information will be a valuable tool in setting rates.

Railroads have not applied cybernetic techniques as aggressively as they might have because of resistance to change and governmental regulatory policies concerning pricing. Harvey M. Romoff, manager, department of research, Canadian Pacific, described the relationship between cybernetics and government regulation in a paper presented at the Tokyo cybernetics symposium. Excerpts follow:

The major problem facing the railroads is establishing the proper "climate" so that the implementation of cybernetic techniques moves ahead as expeditiously as possible. The reasons for this situation are many, including the "age" of the railroad industry compared to most other modern industries, the longevity of its capital plant and equipment and the declining shares of many transportation markets which have been forced upon the railways as new forms of transport emerged and developed.

The factors enumerated above cannot be changed easily and the railroads will have to live with them. Another important factor that can be changed is public regulation of the railroads. It has been basically inimical to the development of the cadre of highly motivated, aggressive managers needed to accelerate the implementation of cybernetic techniques.

Public regulation has done this by failing to distinguish between railroad policy and national policy and using the railroads to accomplish certain national policy objectives regardless of the impact of such policies on the railways themselves. I have in mind such national policies as the conscious use of railway service and pricing to favor certain regions, certain industries or certain types of passengers.

## Rails absorb national costs

The result is that railways, be they privately or publicly-owned, have been absorbing substantial costs attributable to national policy objectives. The consequence has been a very significant reduction in the earning capabilities of the railroads, leading to deficits or else inadequate returns on capital. This is not a healthy climate in which to motivate existing managers, or to attract aggressive new blood into the railroad industry. It certainly does not encourage the development of a cybernetics-minded management, or an innovative approach to the railroad management.

On the commercial side, public regulation has not only been responsible for a managerial lag, but it has also directly impeded the development of new techniques and approaches which lean heavily on the cybernetic approach. The essence of this approach is the full use of modern information, communications and computational techniques. It makes available to managers data and information several orders of magnitude more complete and timely than ever before. It permits the manager to calculate the costs of an operation with some precision; it permits him to set and monitor service standards; it permits him to analyze his markets, customers and competitors in great detail. It is readily acknowledged that the commercial aspects of the railroad industry can never be made completely scientific; commercial judgment and negotiating ability will always remain important. But cybernetic techniques can go a very long way in establishing a sound basis from which to apply the necessary commercial judgement and negotiating ability.

Major commercial innovations, made possible by changes in technology, operations, information or communications, are too often stifled or delayed by regulatory policy. Not only does the railroad suffer, as it does, by not being able to act in its own commercial best interests, but so does the entire economy as the result of unnecessarily high transportation costs.

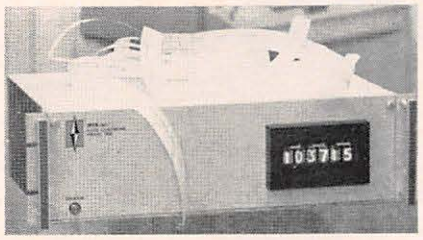
In Canada, in recent years, it has been apparent that the regulatory approach was inappropriate to the economics of life. Canada followed the approach of substantial deregulation of the hitherto regulated mode, to reflect the changed market structure and to rely on the new forces of competition, rather than public regulation, to be the driving force in the allocation of transportation resources. New transportation legislation early in 1967 provides for complete deregulation of the general rate level, for all modes of transport. Carriers are permitted to implement general rate increases in the amount and at the time of their choosing, subject only to the filing and publication of rates.

Maximum rate regulation is to be applied only where the railways can be shown to be in a monopolistic position vis-a-vis a specific shipper. With regard to minimum rate regulation, all rates are required to be "compensatory" and this is defined in the legislation to mean "exceeding variable cost."

The general approach of the Canadian legislation is that, in those instances in which a railway company is incurring a loss on a service it is required to provide as an imposed public duty, the railway should be compensated for this loss out of public funds.

It is still too early to tell what has been the impact of the new approach to railroad regulation in Canada, as it is yet to be fully felt. However, a climate has been established within which the railroads are substantially masters of their own destinies.

# Product News



## Converter changes BCD output to ASCII (101)

The new model CC1010 code converter, when rack mounted, measures 19″ wide x 10½″ deep and 5½″ high. Upon command, the CC1010 converts the BCD output of a 24-hour digital clock to a serial ASCII code to drive various display or printing devices such as a Teletype model 33 or 35 printer.

A wide range of options are offered to allow external identification printing, program timers, set time outputs, horizontal and vertical tab codes, parity generation, indexing codes, automatic time printing, etc. The CC1010 is all silicon solid state, excluding the clock display tubes, using the latest in integrated circuits and MSI devices. *Nationwide Electronic Systems, Inc.*

## High speed printer relay is transistorized (102)

A transistorized high speed telegraph relay, designed to surpass in efficiency, speed and reliability standard mechanical polar relays in Teletype machines and central office telegraph repeaters is the model 538-A. This relay plugs directly into the type 255-A socket in any Teletype machine without modifications or wiring changes. As it has no contacts to arc, pit or require cleaning and adjustment, the unit is said to be maintenance free. It provides distortionless response at speeds up to 200 bits per second, and up to 400 b/s if a small amount of distortion can be tolerated.

The new relay performs like an electronic repeater and corrects large amounts of characteristic distortion. A simple locking screwdriver adjustment sets the electronic bias control to compensate for line leakage, interference and wide variations in equipment and signal line conditions.

This device is said to work equally well on any standard telegraph transmission line—two-level 10 and 30 ma, as well as neutral or polar 20, 30, or 60 ma. For operation at other levels the relay is available on special order. Any number of the devices may be used in series without causing interaction with other units or associated equipment on the same signaling circuit. This is possible because the relay's input and output circuits are completely isolated and the purely resistive input creates no inductance in the signal line.

Switching capabilities of the model 538-A are rated up to 500 volts DC and up to 2 amp, with a maximum switched output of 100 watts. *Trepac Corporation of America.*

## UHF radio available with 12 channels (103)

A 12-channel UHF two-way radio may be obtained in 35 watt or 70 watt mobiles in the 450-470 MHz range. It may be ordered with less than 12 channels and expanded in the field at a later date. Channel add-on costs are kept low through the use of a single oscillator module per channel. The control head has a rotary channel switch and the channel is displayed in an illuminated window above the knob. In the receive or standby position, the light is white. When the transmitter is on, a red light illuminates the window.

High power audio is used—five watts. Duplex operation is available as an option on the 35 watt series. Other options include solid-state Channel Guard—protection from the nuisance interference of other users—applicable to any one, any combination or all 12 channels. Electronic voltage regulation insures consistent radio range performance. A solid-state voltage regulator built into the power supply stabilizes all power supplied to the transmitters and receivers with the exception of the power output stages and tube heaters. *General Electric Co.*

## Data terminal is wideband unit for cables (104)

Data terminal type B313 PCM provides accurate high speed 0-256 kilobits per second data and voice transmission over exchange type telephone cables. The B313 PCM wideband data terminal transmits serial, synchronous or asynchronous data signals from digital computers, interface data sets, facsimile equipment, high speed printers or other data processing equipment. *Lynch Communication Systems Inc.*

## Chain-link fencing has aluminum-steel wire (105)

Fencing, of the chain link type, using Alumoweld wire is described in bulletin 174-1-69. A feature of this fencing is that the steel wire has an aluminum cladding which is at least 10% of the radius of the wire. *Copperweld Steel Co.*

## Antenna guide has know-how for selection (106)

Antennas for VHF radio are described in form AS-001 which is a basic guide to selection of the optimum type of antenna for both base and mobile radio installations. Relative antenna efficiency; effective height; receiver sensitivity and selectivity; and transmitter power, as well as effects of transmission loss and antenna gain, are described in the publication. *Antenna Specialists Co.*

## Mark & space made into digital pulses (107)

Type 7275A frequency shift diversity converter changes mark and space frequencies from RF communication receivers into digital pulses capable of operating teleprinters, data processors and other input-output equipment. This two-channel diversity unit can be used with single receiver frequency

diversity systems or with two receivers in space diversity operation. In space diversity operation, frequency shifts up to 850 Hz can be accomplished by switch selectable methods. Basically, the unit accepts FSK tone signals and converts them to digital signals suitable for operating a teleprinter. *Tele-Dynamics.*

## Microwave system works in 2GHz range (108)

A new solid state microwave system operates in the 2 GHz band. Designated the MR-200, the new microwave equipment is designed for transmission of up to 300 high quality voice channels. The MR-200 equipment has built-in expansion capability for voice, data, or facsimile channels and is designed so that remodulating repeaters are practical on long-haul systems. This provides maximum flexibility through baseband access for drop and insert channels at repeater sites.

Other design features include individual module alarm lamps, plug-in modules, convenient metering and alarm output. The MR-200 microwave also accepts any of Motorola's standard multiplex equipments—FM, SSBSC or baseband relaying. *Motorola Communications & Electronics, Inc.*

## Primary batteries are air-depolarized (109)

A complete line of Ucar primary batteries and battery switching units are described in catalog section R-9570. Performance details for the six individual air-depolarized batteries are furnished in catalog sections R-9575, R-9580 and R-9590.

Two new solid state switching units designed to provide uninterrupted power flow are described in catalog sections R-9625 and R-9626. Two price lists, covering the batteries and the switching units respectively, complete the eight-bulletin literature package. *Union Carbide Corp., Carbon Products Division.*

## Telephone dial selector knows multi-digit DC (110)

Selector for telephone dial equipment recognizes multi-digit DC pulse groups and provides a contact closure output in response to a correct code sequence. A new bulletin SE-212 describes the automatic circuit selector 701/705. *Secode Electronics.*

## Retarder speed control works with computer (111)

Retarder Speed Control Module (D99.0901) is a new GRS retarder control module that provides a back-up, closed-loop, speed control system for digital computer controlled yards where no standby or back-up computer is available. Its modular construction makes it flexibly applicable to various applications by arranging its printed circuit boards as required. When used with a computer, this control can achieve accuracy within ± ¼ mph. Also, with this module, fewer retarder operations are needed to obtain the desired control. This capability results in less retarder wear and less maintenance. *General Railway Signal Co.*

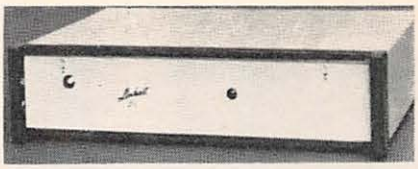
## Guide for wire and cable has buyers' data (112)

A comprehensive guide (G10-04) outlines a broad range of wire, cable and support products for the railroad industry. Information is provided on outside and inside plant communications cables, wiring components for key telephone systems, coaxial cables, control and signal cables, power cables, maintenance cables, line wire and trolley wire.

Other products for railroad application which are included are galvanized strand, stainless steel lashing wire and galvanized or Electroform (copper/steel) line wire, pole line hardware and cable pressurization equipment. *General Cable Corp.*

## Track appliance catalog covers stops, derails (113)

Track appliance catalog covers all types of bumping posts, wheel stops and derails. Also included in the free ring-binder catalog is material on a portable "blue flag" derail for temporary installation on the track to protect workmen. *Hayes Track Appliance Co.*

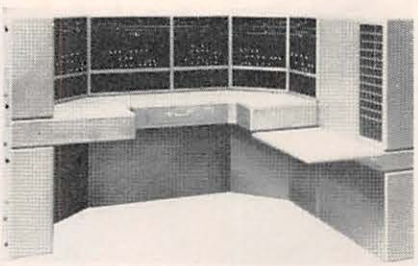


## Data modem processes serial digital data (114)

The 26C, a data communications set processes serial digital data at speeds of 150, 300, 600, 1200 and 2400 bits per second over a standard voice-grade telephone circuit with C1 conditioning. The compact data set is particularly suited for one-way or two-way data communications between computers, business machines, and other applications requiring high accuracy.

The 26C will accept data signals meeting EIA Standard RS-232-B and MIL-STD-188B interface requirements. Optional interface converters are available to meet special signal and level conditions.

Accounting for the performance of the 26C is the use of the Duobinary Technique combined with FSK modulation. Automatic error detection without redundancy, plus a significant improvement in signal-to-noise ratio compared to other multilevel transmission schemes are bonus features of the Duobinary Technique. *Lenkurt Electric Co., Inc.*

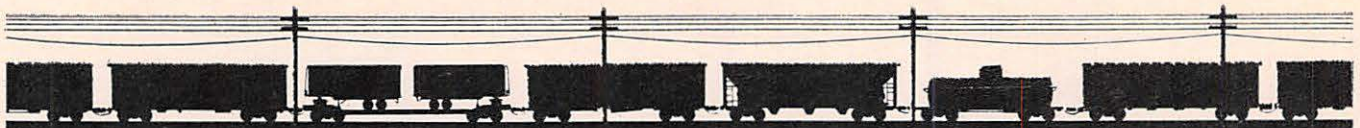


## Interlocking and CTC panels available (115)

Ability to produce interlocking or centralized traffic control consoles is announced by Raco. It has the facilities, materials, and experience to design and build control panels ranging from emergency control boxes to control consoles of any specifications. *Railroad Accessories Corp.*

## Two-way radio features 4.5 watt portables (116)

Two-way radio equipment is described in brochure ECR-1518 which is concerned with portable units that can provide up to 4.5 watts of RF power. *General Electric.*



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**2** Delivery schedules, set up to meet your requirements . . . and strictly maintained.

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  215-563-2603
- Clawson Railway Supply
  9322 Manchester Road
  St. Louis, Missouri 63119
  314-961-5533
- Fitzhugh Railway Equipment Corp.
  2500 West Broad Street
  Broad Street Station
  Richmond, Virginia 23220
  703-358-7184
- Howe-Stephens Company
  1826 Industrial Way
  Redwood City, California 94063
  415-366-9591
- Mikan-Hagerth Corporation
  100 Church Street
  New York, New York 10007
  212-233-2286
- Modern Industries, Inc.
  100 Outer Loop
  P.O. Box 14287
  Louisville, Kentucky 40214
  502-361-1113
- Edward Moriarity
  7 Deerfield Lane
  Huntington Station
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  516-271-1252
- B.W. Parsons Company
  818 Pioneer Boulevard
  St. Paul, Minnesota 55101
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- Western-Cullen Division
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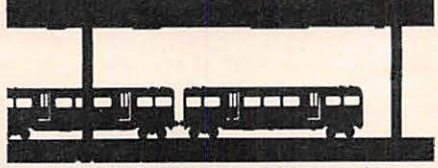
  2700 W. 36th Place
  Chicago, Illinois 60632
  312-254-9600

**The Ansonia Wire & Cable Co**
Ashton, Rhode Island 02864



Circle 18 on reader service card


# People

**CANADIAN NATIONAL:** **Eric P. Stephenson,** vice-president, Prairie Region at Winnipeg, Man., appointed vice-president, cybernetic services with headquarters at Montreal, Que. **John C. Gardiner,** assistant vice-president freight sales, appointed vice-president at Winnipeg to succeed Mr. Stephenson.

**CHESAPEAKE & OHIO/BALTIMORE & OHIO:** **B. G. Parrish** appointed assistant regional supervisor communications at Columbus, Ohio. **F. X. Carraro, Jr.** appointed supervisor communications at Chicago. **R. N. Withrow** appointed assistant supervisor signals at Detroit. **E. M. Smith** appointed assistant supervisor signals, Cincinnati, Ohio. **G. P. Atkinson** appointed project manager planning group, Baltimore, Md. **Lewis B. Michael, Jr.,** wire chief, appointed supervisor of communications services at Baltimore. **Francis L. Wiegmann,** senior industrial engineer, appointed manager industrial engineering at Baltimore.

**DULUTH, MISSABE & IRON RANGE:** **Frederick G. Erickson,** procedure technician, appointed data center supervisor. **Francis J. Houstman,** senior industrial engineer, appointed transportation engineer. **Robert A. Huttel,** transportation engineer, appointed manager-industrial engineering. All men are located at Duluth, Minn.

**ELGIN, JOLIET & EASTERN:** **Glenn E. Carlson** appointed project supervisor, data processing division, accounting department at Joliet, Ill.

**KANSAS CITY TERMINAL:** **P. E. Montague** appointed signal and communications engineer with headquarters at Kansas City, Mo.

**ROCK ISLAND:** **B. L. Daniel** appointed assistant signal supervisor, Trenton, Mo. **J. M. Kemp** appointed signal supervisor, Des Moines, Iowa. **W. B. Taylor** appointed signal supervisor, Rock Island, Ill. **J. W. Youngblood** appointed acting communications engineer, Kansas City, Mo.

Frank Aikman, Jr.
Ry S&C Suppliers

Crawford E. Staples
S&C Div, WABCO

**SANTA FE:** **James Y. Scarlett,** general supervisor of automatic train control and train stop equipment at Topeka, Kansas, retired March 1.

**SOUTHERN:** **Walter W. Simpson, Jr.,** director, technological development, at Washington, appointed assistant vice president—engineering and research.

## Suppliers

**COPPERWELD STEEL CO.:** **J. Glenn Beymer,** assistant advertising manager, appointed manager—advertising and sales promotion for the Wire and Cable Division with headquarters at Glassport, Pa. Mr. Beymer succeeds **Albert R. Teifeld,** retired.

**GENERAL ELECTRIC CO.:** **Richard P. Gifford,** general manager of the communications systems division, has been elected a vice president of the company.

**GENERAL RAILWAY SIGNAL CO.:** **Robert A. Sharp** appointed sales engineer in the Chicago office.

**PANDUIT CORP.:** **Duane Johnson** appointed area sales manager in a new direct sales office covering Washington, Oregon, Idaho, from 300 120th Avenue N.E., Bellevue, Wash. 98004.

**PULSE COMMUNICATIONS INC.:** **Roman G. Schweizer** appointed assistant vice president and will direct the supervisory and remote control section, being responsible for development and marketing of alarm reporting and control equipment.

**RAILWAY SIGNAL & COMMUNICATIONS SUPPLIERS ASSN., INC.:** **Frank Aikman, Jr.,** retired president Long Island, elected executive director, secretary-treasurer and a member of the board of directors, succeeding **Arthur H. Smith,** resigned. The association has new offices at the Statler Hilton Hotel, 401 Seventh Ave., New York, N.Y. 10001

**SIGNAL & COMMUNICATIONS DIV. WABCO:** **Crawford E. Staples,** senior systems consultant, appointed chief engineer planning.

# Data Sheet 188

## DATA MODEM CHARACTERISTICS

| | | |
|---|---|---|
| **Manufacturer** | North American Philips | North American Philips |
| **Model** | 600/1200 Baud Data Set | 2400/4800 Baud Data Set |
| **Transmit and/or receive** | Transmit & receive | Transmit & receive |
| **Full and/or Half Duplex** | Half duplex | Full or half duplex |
| **Dial up or Private Line Application** | Dial up | Dial up or private line |
| **Turn around time (HDX)** | 80-180 ms | FDX 80-180 ms |
| **Automatic answer capability** | Yes | Yes |
| **Type modulation** | Frequency shift | Phase modulation |
| **Operating Frequencies** | 1300 & 1700 Hz or 1300 & 2100 Hz | 1100-2300 Hz or 700-3100 Hz |
| **Clock, internal or external** | Either | Either |
| **Loop back testing feature** | No | No |
| **Error rate** | Better than 1 in $10^6$ | Better than 1 in $10^6$ |
| **Error detection and/or correction** | None | None |
| **EIA RS-232-B interface** | Yes | Yes |
| **Bit or character rate** | 600 or 1200 bits/sec | 2400 or 4800 bits/sec |
| **Serial or parallel transmission** | Serial | Serial |
| **Impedance to line, ohms** | 600 | 600 |
| **Impedance to data equipment, ohms** | RS-232-B | RS-232-B |
| **Voltages to and from data equipment** | RS-232-B | RS-232-B |
| **Frequency stability** | — | — |
| **Level stability** | — | — |
| **Output levels to line, dbm** | −7 to −17 | +6 to −25 |
| **Input levels from line, dbm** | 0 to −37 | 0 to −40 |
| **Line requirements, frequency response** | Voice grade | 4B or 4C voice |
| **Line requirements, envelope delay** | Voice grade | 4B or 4C voice |
| **Line requirements, impedance** | Voice grade | 4B or 4C voice |
| **Line requirements, signal to steady noise** | Voice grade | 4B or 4C voice |
| **Line requirements, signal to impulse noise** | Voice grade | 4B or 4C voice |
| **Method of operation** | 2 wire | 2 wire (HDX) 4 wire (FDX) |
| **Temperature and humidity limits** | +32 to +113 deg F 80% | +32 to +113 deg F 80% |
| **Power requirements** | 110 or 220 volts | 110 or 220 volts |
| **Dimensions and weight** | 18" x 21" x 17" | 18" x 21" x 17" |
| **Digital or analog** | Digital | Digital |

Note: Information was prepared by L. J. Ritter, Manager of Communications Plans and Operations, Penn Central. Reprinted by permission of John McNabb, Engineer, Communication & Signal Section, AAR.

# News Briefs

## FCC to manage radio spectrum regionally

By June 1972 the first regional radio spectrum management center should be in operation in Chicago under the Federal Communications Commission new plan for national and regional operation. Initial work will be in the land mobile radio services area. A task force, headed by deputy chief engineer R. E. Spence, Jr., will develop policies, standards, criteria and guidelines for frequency management and coordination and maintenance of spectrum occupancy data. Regional centers will carry out application processing, engineering and assignment of land mobile frequencies under the direction of a national center.

## Pacific Plantronics to merge into Lynch

Agreement in principle of the merger of Pacific Plantronics, Inc., into Lynch Communication Systems, Inc., has been jointly announced by officers of both companies. Merger is subject to approval of shareholders of both companies and appropriate regulatory agencies. Lynch had a record sales of $13 million last year while Plantronics' sales totaled $9 million. Lynch is a major manufacturer of carrier, signaling and data handling equipment, while Plantronics specializes in telecommunications headsets, and through its subsidiary Frederick Electronics Corp., manufactures data transmission equipment and switching systems.

## FEC expands hotbox detector usage

Eight new hotbox detectors have been installed and three existing ones moved to provide 20-mile checks on passing trains. Formerly, spacing of detectors on the Florida East Coast was at 30-mile intervals. Newly installed detectors are at Korona, Indian River City, Wabasso, Boynton Beach, Hallandale, Rim Ditch and Canal Point on the Lake Harbor branch, all in Florida. At Hallandale and Boynton Beach detectors are located on each track of the double-track mainline. Also installed at each detector location is equipment to spot loose wheels and dragging equipment. A broken flange and loose wheel detector was installed in January of this year just north of Bowden yard, Jacksonville. Graphic recorders in the dispatcher's office at New Smyrna Beach report any indicated actuation of each detector station. The dispatcher reads the tapes and radios the engineer of any unusual condition pertaining to the train.

## C&EI obtains FRA approval for CTC

Federal Railroad Administration hearing examiner Robert R. Boyd has approved an application of the Chicago & Eastern Illinois proposing installation of centralized traffic control. C&EI wants to install CTC on 103 miles of line between Woodland Jct. and Findlay Jct., Ill. CTC will replace operation by timetable and train orders in this territory.

## PC ups capacity to handle phone calls

Penn Central has expanded its capacity for handling public telephone inquires about passenger service throughout its busy Eastern and New England territories, and the new system is in the process of further expansion, reports Howard C. Kohout, vice president-passenger service.

Automatic devices to give callers current information as to passenger train operations are already in operation at stations between Albany, N.Y. and Toledo, Ohio, and are being phased in at Bridgeport, New Haven, Hartford and New London, Conn., and Providence, R.I.

These recording machines, kept up-to-date by local railroad personnel at each station, relay information in response to local phone calls without involving the lines to our centralized telephone center in New York," Mr. Kohout said. "In effect, this increases our capacity to handle calls of all types.

"The new centralized system, with 200 incoming telephone lines, went into service in October with an average of 7,500 calls per day from persons seeking information or inquiring about reservations," he said. "It is now handling between 8,000 and 9,000 calls on an average business day, with higher peaks during heavy travel periods and whenever weather conditions ground airlines or close highways."

The phone system, specifically designed by New York Telephone for Penn Central needs, handles local calls to the railroad in the New York metropolitan area, New England, northern New Jersey, upstate New York and points between Buffalo and Toledo. It automatically answers and distributes calls to 73 phones manned by information and reservation clerks. If all the clerks are busy, the system answers the overflow calls with a recording, holds them on the line and then, as clerks become available, distributes calls in the order received.

"During 1969 we increased the number of telephone lines to Penn Central ticket offices in Philadelphia and Washington, and added new employees to man them," Mr. Kohout said. "We are attempting now to expand our information and reservation forces in New York City, but are finding it difficult to hire people willing to work during the evenings, over weekends and holidays—our busiest periods. Most folks seem to prefer 9 to 5 jobs."

He said the railroad is planning to install new "hot line" phones between each ticket office in the principal New Haven Region stations and the New York reservation center to speed inquiries from ticket clerks. This will free regular phone lines for other calls.

"We have added more automatic reservation and ticket-issuing machines, connected with the Ticket Reservation Service computer in New York, to sell Metroliner tickets at Grand Central Station, New York and Penn Central Station, Baltimore," he said. "We are also installing a TRS machine in the Wilmington, Del., city ticket office in the DuPont Building so tickets can be issued there. All these steps reduce inter-office phone calls, freeing our lines for incoming calls from the public."

## Whitman talks about signals and safety

"There have been a considerable number of accidents due to engineers failing to comply with aspects displayed at wayside signals. Some recent accidents involving signals that we looked into showed that 85-90% were due to human factors and only 10-15% attributable to defective signals. There is an average of one major accident a month due to employees failing to heed visual aspects," said Reginald N. Whitman, administrator, Federal Railroad Administration, at the Western Sectional meeting

*(Please turn to page 40)*

# NEWS BRIEFS

*(Continued from page 39)*
of the Communication & Signal Section, AAR April 15 in St. Paul, Minn.

"In the grade crossing situation we have the problem of motorists being misled by malfunctioning or excessive operation of the signal. Often these incidents are due to improper maintenance or to cases where the circuitry is not sufficiently sophisticated for a particular crossing.

"Recently there have also been a number of serious accidents at interlocking systems on a "dead section" of track due to solid steel frogs. We are working with a manufacturer of electronic devices to come up with something that would prevent such "occurrences."

Whitman also said that "we are working closely with a consulting firm and the rail carriers involved in the Los Angeles area in conducting tests on a high voltage DC transmission line to determine what effect stray ground currents will have on our present signaling and communications systems."

In another area Whitman suggested: "Perhaps we could get moving on the development of a new signaling system which would indicate other than trains in the block, e.g. curvature, tangent of track and such things as vehicles blocking crossings. This raises the ugly specter in all of your minds, I'm sure, of the engineer constantly applying the emergency brakes. This, of course, would be unacceptable. At any rate, I throw this out not as a plan we've seriously considered nor a project we're engaged in. It is merely an example of the direction in which we should be heading in our search for solutions—untapped areas that need exploring.

"As part of our R&D efforts in the Office of High Speed Ground Transportation, an in-house effort has begun to develop a vehicle surveillance system to guarantee the safety and improve the operating efficiency of high speed ground vehicles.

"In the very important area of obstacle detection, last year a feasibility model of a scanning device was developed for the Department. Obviously, any future vehicle traveling from 200-300 mph will need positive indications that its track or guideway is free of obstructions two or three miles ahead, far beyond human sight limits.

"The scanner works in the following manner. Positioned alongside the track, it sends a very narrow, invisible infrared beam just above both tracks to a retroreflective strip fastened on the opposite side of the track. If no object blocks it, the beam is reflected back to a receiver in the scanner indicating that the way is clear. Should the light beam detect an object one inch or more in width, however, there is either a very faint signal or none at all. Present estimates are that ten to twenty scanners will be required for each mile of track.

"We are looking further into the possibility of developing and demonstrating an automatic train control system. I assure you, we are appraising the value of such a system for future use in the light of past train control policies. This, of course, is an enormous project of many dimensions. It will take much time, money and cooperative efforts. It involves development, testing and demonstration of a technologically advanced system which will contribute to the railroads' economic efficiency—and I can't stress that enough—as well as its safety," Whitman said.

## Syntonic expands service via acquisitions

Electronic maintenance and service to customers has been expanded to include the west coast and Colorado by Syntonic Technology, Inc. The Melbourne, Florida firm that provides radio and electronic maintenance for railroads has acquired Radio Specialists Co., Denver, Colo., and Precision Standards Lab, Los Angeles, Calif.

## Grade crossings can be improved says study

Improvements costing $580 million to 30,000 railway-highway grade crossings can be justified, according to a research report prepared for the Federal Railroad Administration by Alan M. Voorhees Associates.

If the recommended improvements were made, the report states, the accident rate would be reduced to one-half the number which would be expected if no improvements were made. At present, accidents at crossings result in 1,500 to 1,800 deaths, 3,500 to 4,000 injuries each year and economic losses in excess of $300 million.

Recommendations for improvements in safety at grade crossings include five major objectives: 1) reduce grade crossing accidents by 25 percent; 2) develop special devices which will help reduce accidents at grade crossings with low vehicle and train volumes; (3) complete accurate inventories and records of all grade crossings, accidents at these crossings and costs so that future policies may be better formulated; (4) improve cost and benefit information as a basis for selecting improvement projects of merit; and (5) carry out demonstration projects in several communities with the objective of eliminating unnecessary crossings and providing protection for all crossings which are allowed to remain.

## Burlington Northern sets up data unit

Burlington Data Services Inc. is a new subsidiary of Burlington Northern and it will provide systems and programming services for business concerns as well as the parent railroad company. **Wilbur K. Bush**, vice president executive department BN is president of the new company, which will be located at 547 West Jackson Boulevard in Chicago, the regional headquarters of BN and former headquarters of the CB&Q. Bush said the new firm provides technical assistance in developing teleprocessing and computer techniques and a wide variety of batch program applications. The firm also will offer "hardware time sales" for its IBM 360/40 and 50 computer equipment. The firm is prepared to undertake facility management activities as well.

## Reading to extend electrification

Department of Transportation has granted $862,610, according to secretary Volpe, to the Southeastern Pennsylvania Transportation Authority for 50% of the cost of extending electrified commuter service of the Reading. The extension of 1.8 miles will be between the suburbs of Hatboro and Warminster, near Philadelphia.

## TWX plus Telex equals more competition

Western Union, which is seeking to acquire Bell System's teletypewriter exchange service, told the FCC that such a move would "strengthen competition in the most important area between WU and the Bell System." Competition will be enhanced, WU claims, because customers will have a choice between two common carriers supplying different modes of communications.

"Moreover, competition between the carriers in the area served by TWX will not disappear, inasmuch as the Data-Phone and other record services will continue to be offered by the Bell System and the Independent telephone companies.

WU said it is not a manufacturer of communications equipment and has no connection with any such manufacturing organization. It obtains equipment in the open market by competitive bid. This practice will, if the acquisition is effected, bring the manufacture of TWX terminal equipment and Data-Phone terminals operating at 300 bits per second or less into the area of competition between manufacturers.

Concerning policy regarding customer-provided terminals, WU said it "will permit the connection of customer-provided terminals—which meet certain specifications—to the TWX service, so long as the network control signaling and protective interface devices are furnished by Western Union."

## Southern will upgrade signals; remove ATS

In line with a hearing examiner's report, Southern is planning to spend $2,148,000 over the next two years for 100 miles of CTC. This expenditure is proposed by the railroad in return for permission to discontinue operation of its intermittent inductive automatic train stop system, operating over 2,765 miles of road.

Robert R. Boyd, Federal Railroad Administration director of office of hearings and proceedings, has ruled that Southern may discontinue its ATS system operation provided it meets four conditions:

—Investments in safety be made including the CTC mentioned above plus an additional 145 miles of automatic block signaling be installed, costing $1.5 million (proposed by the railroad).

—That such installations shall be over and above improvements otherwise planned and budgeted.

—That all existing semaphore signals be replaced by colorlight signals within four years of the date of the FRA order.

—Southern will keep separate accounts and so notify FRA to show allocation of funds as the railroad proposed, and show how the money was spent on an annual basis.

Effective date of the examiner's decision was May 15, unless stayed by the Railroad Safety Board or the FRA administrator. Also, there was a 20-day stay following the April 15 examiner's report "to allow for receipt of additional suggestions."

Southern installed its ATS equipment during the period 1922-1928 under prompting from the Interstate Commerce Commission. ICC during this period ordered 49 railroads to

*(Please turn to page 42)*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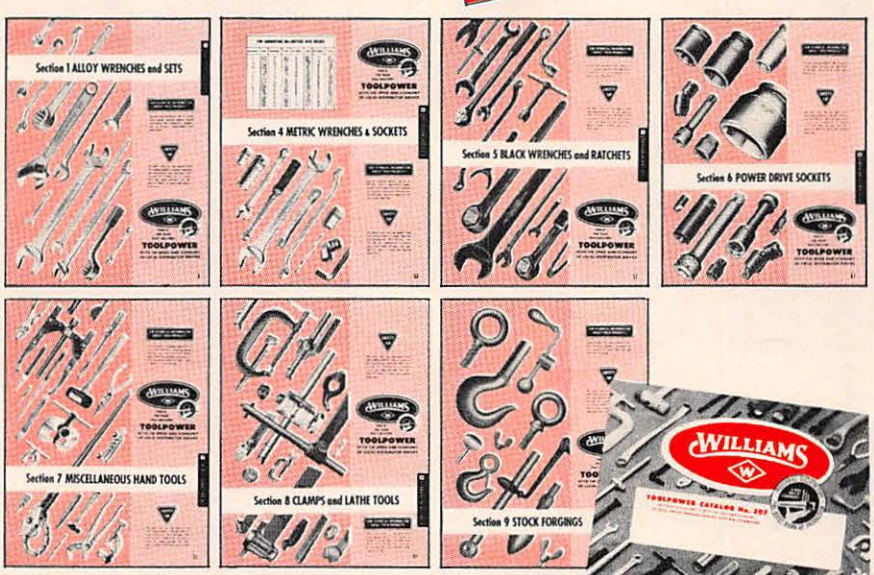
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# NEWS BRIEFS

*(Continued from page 41)*
install ATS or train control devices on at least one passenger locomotive division.

Meanwhile, Southern has upgraded the signal systems in ATS territory. For example, CTC has been installed on 865 miles of road and all but 206 semaphore signals have been replaced with colorlight units. Additionally, all locomotives are equipped with a "deadman pedal" which, if released by the engineman will bring the locomotive to an emergency stop. Over 1600 miles of welded rail have been installed in ATS territory. Another added safety improvement has been the installation of hotbox and dragging equipment detectors, plus the use of two-way radio by crews and dispatchers. In its petition to FRA, Southern cited several examples of radio usage that avoided train accidents.

As for the economics of removing ATS equipment, the railroad will receive a net salvage of $113,400. Also, it will not have to spend $1,096,687 to equip 127 new locomotives with ATS units. In addition to this one-time saving of $1,210,087, annual savings of $266,000 in maintenance, inspection and repair of locomotive and wayside ATS units will result from discontinuing the train control system.

"The main premise of this proceeding is that greater railroad safety would be obtained per safety dollar by reallocation of funds from the automatic intermittent inductive train stop system into other systems or devices which, although not serving safety in the same way, nevertheless increase railroad operating safety and do so in large measure . . . The showing here is the same as it was in the numerous prior decisions in which relief was granted [permission to railroads to remove train control systems] that is, that the accident rate on ATS lines is no better than on comparable non-ATS lines," Boyd said.

## Italian plant to mfg signaling items

A new plant for the manufacture of railway and rapid transit signaling and remote control equipment has been opened near Turin, Italy by Compagnia Italiana Westinghouse Freni e Segnali. It will be operated by Italian WABCOs Railway Signaling and Remote Control Division.

The new facility will assemble and test a variety of trackside signals and equipment which control movements of passenger, freight and urban railway equipment. These include not only visual signals, but complex electronic consoles which automatically control train movements on the line and in marshalling yards.

## Panduit Corp. opens new office in Texas

A new sales office to serve the state of Texas, excluding El Paso County, has been opened by Panduit Corp, located in the Empire Central Building, 7701 Stemmons Freeway, Dallas 75247. The office will be managed by Robert Saunders as area supervisor. Field salesman is Robert Hamilton.

## BofRs asks for formal training in notice

In a Section 6 notice served on the railroads in the U.S. on May 18, the Brotherhood of Railroad Signalmen asked for a formal apprenticeship training program. The Section 6 notice covering 1970 fringe benefits states: "Establish a formal signalman apprenticeship training program for signal employees, effective July 1, 1970, to be registered with the Department of Labor, Bureau of Apprenticeship and Training, providing standards of apprenticeship for such matters as: length of apprenticeship, types of training, ratios of apprentices, working conditions, classroom instruction, qualifications for entering apprenticeship, work of apprentices and promotion to mechanic."

## MTA looks for power saving system

New York's Metropolitan Transportation Authority is looking into the possibility of obtaining a system that can conserve energy of a moving subway train, hence provide savings in electric power consumed.

MTA is seeking Federal and State funds to enable it to evaluate an energy conservation system which could reduce power costs for the New York City subway system by several millions of dollars annually.

The proposed system would utilize the energy of a moving subway train, presently dissipated as braking heat when the train stops, to drive energy storage machines which would absorb this energy to bring the train to a halt and then transform the stored energy to electricity to start the train moving again.

At the motorman's command, this machine would be engaged and energized by the train's momentum. This would slow the train down by making it do extra work, just as it is easier to stop a car going up a hill than going down.

The momentum-powered machines would each be linked to a flywheel beneath the train making them revolve at very high speed. When the train is ready to pick up speed again, the spinning flywheels would drive this machine, now connected as a generator, to produce as much as half the electricity required to accelerate the train and keep it in motion until the next stop.

Such a system has long been sought by the MTA. However, railway equipment manufacturers lack the metallurgical and technological experience with high-speed revolving machinery to enable them to undertake the project. The Garrett Corp., a Division of AiResearch Inc. of Los Angeles, encouraged by the interest of Chairman Ronan, has now devised a system which is based upon its experience with jet engines and other high-speed rotating machinery associated with the aerospace industry.

Subway cars require maximum power during acceleration; their power needs diminish as speed increases. The cost of electric power is based on the peak demand as well as total consumption.

Garrett's energy storage system would reduce both the peak power requirements and total consumption. The air-conditioned cars appearing on the subway system in increasing numbers require more power, and hence will ultimately necessitate additional substation capacity. The energy storage system could make it possible to operate more air-conditioned cars without major expansion of the existing power supply system.

It would in additon eliminate braking heat from the tunnels and platforms of the subway system, making the entire system more comfortable. It would also eliminate much of the noise associated with the present brake system.

The Garrett stored energy system "offers promise of making the entire rapid transit system more pleasant while saving money," Chairman Ronan said, "and we are hopeful that the State and Federal Governments will make funds available to permit us to try it out."

The evaluation program would require an estimated 24 months for completion, with the first twelve months devoted to fabrication and installation of the system on two conventional subway cars, the next six to nine months on actual testing, and the remaining three months on study of the results.

Total cost of the entire project is

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| 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 |
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estimated at $1.7 million. The Tri-State Transportation Commission, acting on behalf of MTA, has requested U.S. Department of Transportation funds to cover two-thirds of this amount. The Garrett Corp. will itself contribute $100,000 and the State of New York is expected to pay the balance.

## MKT wins approval from FRA for CTC

Missouri-Kansas-Texas has received approval from the Federal Railroad Administration hearing examiner Robert R. Boyd to install a centralized traffic control system between Granger and Taylor, Tex., approximately 10 miles. The CTC will replace automatic block signaling on single track. The control machine will be located at Granger station and there will no longer be any need for train orders concerning operations between Granger and Taylor.

## SC&E spending in '70 tops $270 million

Thirty-five foreign railroads report plans to spend $272,573,272 for signal, communications and electrification projects during 1970. According to *International Railway Journal*, signal projects account for $122,034,014, communications projects will take $40,004,915 and electrification projects are budgeted for capital expenditures of $110,534,343 during 1970.

A breakdown by railways follows with amounts listed in U.S. dollars: Algerian State Railways—$505,750 for signals, $341,887 for communications, and $202,300 for electrification.

In Australia, the Commonwealth Railways will spend $690,800 as follows: signaling—$26,400, and communications—$664,400. Tasmanian Government Railways is planning to spend $2,200 for signaling and $5,500 for communications.

Austrian Federal Railways will spend $3,056,975 for signaling, $367,650 for communications, and $5,418,000 for electrification.

National Railways of Colombia is budgeting $240,000 for communications projects during 1970.

Finnish State Railways plans to spend $2,100,415 for signal projects, $526,900 for communications facilities, and $2,538,700 for electrification in 1970.

French National Railways has spending plans for 1970 in the SC&E area totaling $59,273,900. Electrification will receive $29,738,100, signaling will receive $24,276,000 and com-

*(Please turn to page 44)*


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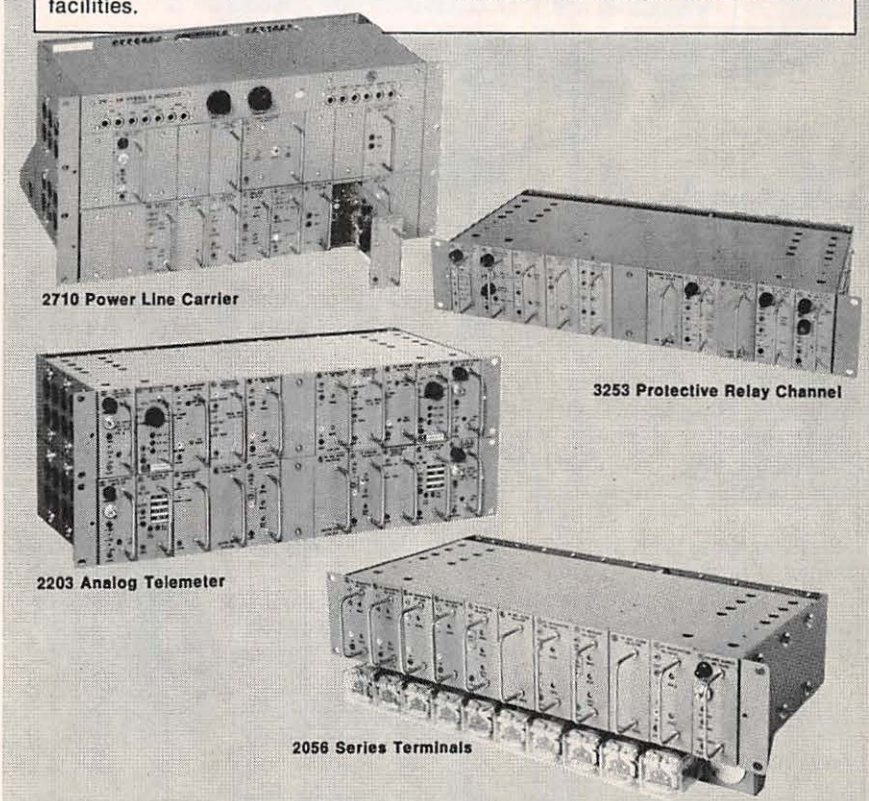

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# NEWS BRIEFS

*(Continued from page 43)*

munications projects will receive $5,259,800.

Ghana Railway is planning to spend $172,480 for signal projects and $101,920 for communications projects in 1970.

Four railways in Germany are planning SC&E projects totaling $1,191,764. Altona-Kaltenkirchen-Neumunster Railway is planning for signal expenditures of $17,360 and communications expenditures of $13,020. Cologne-Bonn Railways has a signal budget of $43,400 for capital expenditures. For communications, $21,700 is allotted for 1970. Electrification spending in 1970 for capital projects will come to $86,800. Hamburger-Hochbahn is planning for $586,334 on electrification projects, $65,100 for communications facilities, and $325,500 for signal projects. Osthannoversche Eisenbahnen will spend $32,550 for signaling.

Kowloon-Canton Railway of Hong Kong is planning to spend $80,000 for signal projects and $6,320 for electrification.

Western Railway of India has budgeted SC&E projects in 1970 totaling $7,338,500, as follows: signaling—$1,467,180, communications—$226,980, and electrification—$5,644,340.

Coras Iompair Eireann of Ireland is planning to spend $69,600 for signal projects in 1970.

Italian State Railways are planning to spend $16,000,000 for signal projects this year, while communications is slated for $4,872,000 and electrification at $5,600,000.

In Japan, three railways and subways are planning to spend $76,241,220 on SC&E projects in 1970. Japanese National Railways will spend $37,984,800 on signaling, $10,472,000 for communications, and $22,699,900 for electrification. Osaka Underground Railway will use $1,686,440 for signal projects, $113,120 for communications, and $988,960 for electrification. Kei-Han Electric Railway plans to spend $954,800 on signal projects in 1970, $137,200 for communications projects, and $1,204,000 on electrification.

Hedjaz Jordan Railway is budgeting $280,000 for electrification and $5,600 each for signaling and communications in its 1970 spending plans.

Sabah State Railways in Malaysia is planning to spend $32,000 each for signaling and communications in 1970.

National Railways of Mexico is budgeting signal projects at $120,300, communications projects at $1,122,-

800, and electrification at $360,900 in 1970.

Netherlands Railways will spend $693,250 on electrification, $748,710 on communications, and $7,986,240 on signaling.

Nigerian Railways is budgeting for 1970 spending in the signal area an amount of $3,080,000.

Norwegian State Railways are planning to spend $2,478,000 for signaling, $686,000 for communications and $3,444,000 on electrification.

Philippine National Railways is budgeting $112,500 for signaling projects and $366,500 for communications facilities during 1970.

South African Railways will spend $28,271,488 as follows: signaling—$8,153,323, communications—$9,496,063, and electrification—$10,622,102.

Spanish National Railways will spend $10,027,160 for signal projects, $3,371,940 for communications, and $13,497,777 on electrification. Also in Spain, Catalanes Railways will spend $257,400 on signal projects, and $200,200 on electrification.

Sudan Railways are planning to spend $8,610 on communications projects during 1970.

Swedish State Railways is budgeting $527,436 for signal projects, $343,896 for communications, and $440,496 for electrification during 1970.

Swiss Federal Railways is planning to spend $6,032,000 on electrification. Also in Switzerland, the Montreux-Oberland Bernois Railway is planning to spend $11,600 for signal projects and $4,640 on communications projects. Another Swiss line, the Rhatische Bahn will spend $432,680 on signal projects, $386,744 for communications and $249,864 on electrification.

State Railway of Thailand plans to spend $7,925 for signal projects and $2,235 for communications projects in 1970.

## FCC swamped with microwave requests

After opening the door to common carrier microwave system competition to the telephone and telegraph companies, the Federal Communications Commission has been literally swamped with applications for construction of special service microwave systems. According to Telecommunications Reports, the FCC has received applications covering over 1,700 microwave stations, as of April 27. Among them is Southern Pacific Communications Co., which has filed applications for two systems: East St. Louis, Ill., to Los Angeles, Calif. in-

*(Please turn to page 46)*


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Need more reasons? Call your local RCA Industrial Tube Distributor. For starters, ask him for the new 1970 Guide to RCA Industrial Tube Products, or write: RCA Electronic Components, Commercial Engineering, Dept. 164F, Harrison, N. J. 07029.

RCA

# NEWS BRIEFS

*(Continued from page 45)*

cluding 95 stations; and a 70-station system along the Pacific Coast.

In an earlier decision, the FCC approved of plans by Microwave Communications Inc., to construct a St. Louis-Chicago microwave system. While this decision "indicated a disposition to foster a more competitive communications environment," the new "special service" common carrier applicants will have to show that the services they propose to offer "may reasonably be expected to be productive of public benefits and will otherwise be technically and economically sound," said Bernard Strassburg, chief, FCC common carrier bureau.

Bell, General Telephone & Electronics and Western Union have asked the FCC to deny the applications of Data Transmission Co. for a 244-microwave station digital network, or to hold full-fledged hearings on the matter. Datran, a wholly owned subsidiary of the University Computing Co., plans to build its $375 million system to serve 35 major metropolitan areas from Boston to San Francisco.

Basic objections to the Datran plan and other competing microwave system applications generally are concerned with the impact on the nationwide averaging rate plan, frequency congestion, harmful radio interference and questions of public need for the proposed services. Established common carriers ask the Commission: On what basis would it regulate or control competition between Datran and the established carriers?

Western Union believes that "the public interest will best be served by an indefinite postponement of any kind of action with respect to the Datran applications until the Commission has had adequate opportunity to study underlying policy questions pertaining to the applications of Datran and other applicants and groups of applicants seeking to enter the field of point-to-point microwave common carrier service."

Regarding the initial grant to MCI, Western Union took the position that "The Chicago-St. Louis service proposed by MCI is a long way from becoming a reality. Applications for modifications of key stations along its proposed route have recently been filed. Also, the Commission's grant . . . is on appeal to the federal Court of Appeals for the District of Columbia Circuit. No experience has yet been accumulated on such important questions as whether the benefits asserted by MCI would ever be realized or whether the MCI Chicago-St. Louis relay system would take significant volumes of customer traffic from existing carriers . . .

"No one knows at this juncture if the benefits asserted by MCI will ever materialize. Certainly, the Commission should have the answer to that question before permitting further invasion by new carriers into the field of servicing the communications needs of business and industry."

The series of questions raised by the Bell System companies in their petition to deny included, in addition to those mentioned above, inquiries related to possible uneconomic duplication of common carrier facilities; adverse effects on users, as through impact on the nationwide uniform rate structure; extent of public demand not being met by existing carriers; whether any unmet need could be fulfilled at lower cost by expansion of existing facilities; relative efficiency in terms of radio spectrum usage of existing or new carriers; and whether Datran's proposal is economically and technically feasible.

"Serious underlying policy problems need to be resolved after development of full information on such matters as (a) the services which existing carriers are providing in the data


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and record transmission field; (b) the plans of existing carriers to meet needs for data and record transmission services; (c) the nature and extent of the need, if any, for additional common carriers in this field; (d) whether criteria should be established to determine whether proposals for common carrier service by new carriers would meet public needs; and (e) availability of common carrier frequencies to meet emerging needs for intra- and inter-company business communications," Western Union said.

The General System companies took the stand that "The proposed Datran routes will cause harmful electrical interference and duplicate existing interstate facilities constructed by these companies or by carriers with which they connect and jointly provide interstate service."

The MCI case took another turn, when following that company's application to modify its original Chicago-St. Louis system, the Bell System companies have petitioned the FCC to deny the MCI changes. Bell said that the changes "propose fundamental changes in each of the 11 stations for which construction permits have been issued, including changes in antenna system, radio frequency, transmitter equipment, authorized power and station locations, which in turn would greatly increase the cost of the proposed system.

"They propose a high density system having a maximum capacity of 1800 voice grade (4 kHz) circuits—as contrasted with the 960-circuit theoretical capacity of MCI's proposed system.

"Based on computations derived from the sparse information contained in the modifications, the new construction cost would be up to four times greater than the cost of the system approved by the Commission. Moreover, MCI's operating expenses during the critical first year would be over 300% higher under the modifications."

The General Telephone Co. of Illinois observed that "Rather than reduce problems by this filing, MCI has increased them." Among other things, it declared that "General and MCI have had several discussions to eliminate frequency interference. The result is that MCI will not harmfully interfere with General in three cases. It is to be noted that the outstanding construction permits do not interfere with General's stations."

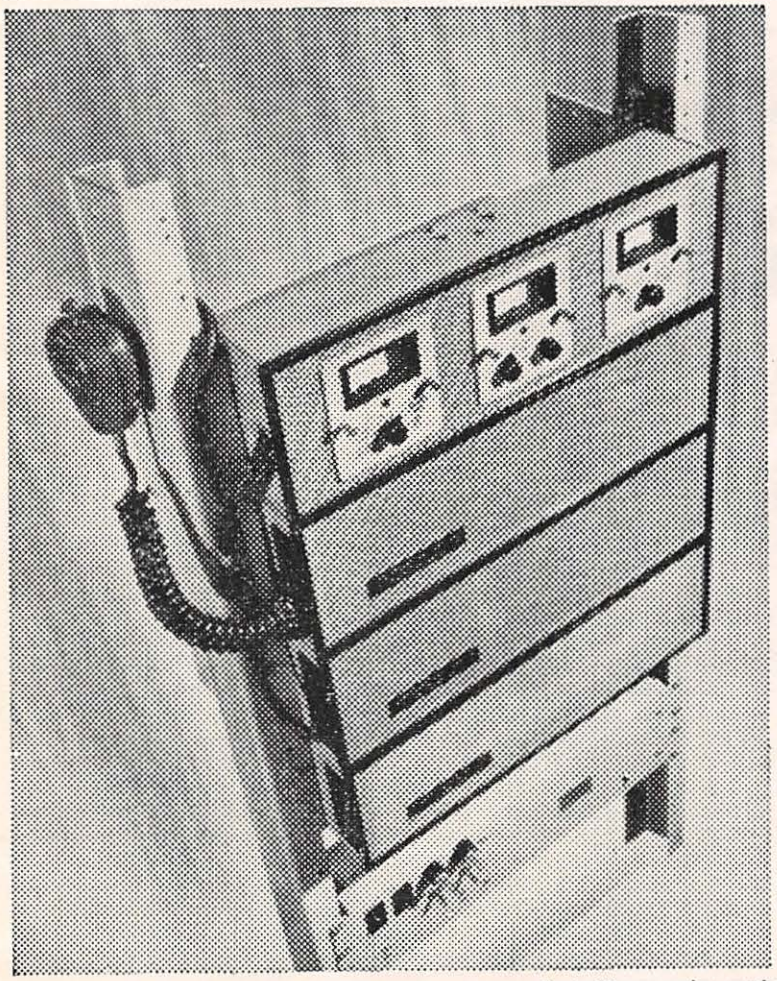
It stated that "The Commission found MCI financially qualified for a $600,000 system, not a $4,000,000 system . . . MCI casually lists the cost of equipment for its amended applications at $4,000,000 and goes on to say that Raytheon will finance the equipment. We are told that MCI is financially sound because Raytheon is willing to extend credit. This is bootstrap reasoning."

Meanwhile, Datran told the FCC that unlike the common carriers it is offering a unique service and cannot be considered a wasteful duplication of existing facilities. Datran's comments were made in answer to petitions from Bell System companies and Western Union requesting the FCC to deny the Datran applications for a transcontinental microwave system.

"Grant Datran special interim authority to construct and operate its system in order to meet the strong public interest which requires prompt establishment of the services proposed; and designate, immediately, the Datran applications for expedited hearing . . ."

Issues for such a hearing, Datran said, should include: "(1) what is the nature and extent of the existing and projected market for data communications services; (2) is the Datran proposal appropriate to the needs of that market; and (3) can significant public benefits be reasonably expected from Datran's competitive alternative to the services offered to data users by

*(Please turn to page 48)*

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# NEWS BRIEFS

*(Continued from page 47)*

the established carriers?"

In regard to possible uneconomic duplication of facilities, Datran observed that "The construction of new facilities becomes uneconomic and not in the public interest when they are similar in technology to facilities already constructed and merely serve to duplicate the services already provided a particular market segment. However, Datran's proposal is for a nationwide digital data transmission system, whose components comprise an end-to-end communications common carrier network which materially differs from any proposed or existing system."

On another point, it reported that "Datran's proposed charges have been developed on a basis fully consistent with the rate averaging concept. Datran's thin routes and marginal customers will have at least the same pricing benefits as those afforded customers" of the Bell System and Western Union.

Characteristics which distinguish Datran from the other applicants, it declared, include: switched digital service; end-to-end compatibility, while the others require interconnection with established carriers; "highest standards of accuracy"; dedication to data users; and coast-to-coast coverage.

Datran said that during its market research, it has contacted several hundred customers of the existing carriers. Among things which "most" believe, it said, are that over 85% of data sets connected to the switched network transmit at 30% or less of circuit capacity, and the nearly two-thirds of those data sets are being used at less than 15% of capacity.

They also believe, it declared, that "User needs for quality service are not being met by established carriers because of: inconsistent reliability, poor circuit availability, inadequate maintenance long installation lead times, and paucity of qualified and responsive technical support."

## RACO acquires Stiles product line

Following a fire which destroyed its manufacturing plant, T. Geo. Stiles Company has sold its inventory, raw materials, tools, dies and patterns required to continue the production of their products, to Railroad Accessories Corp. RACO will manufacture the Stiles product line at its Fairdale, Ky. plant.

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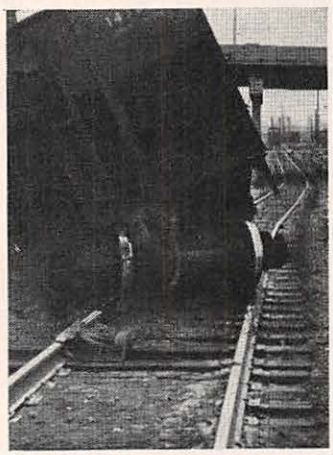

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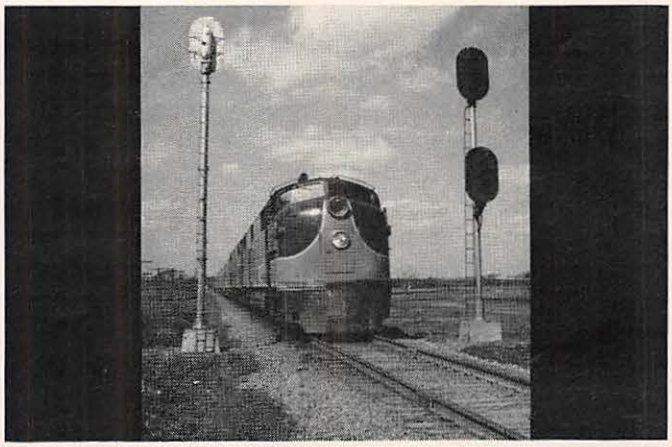

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# Editor's Corner

## Manager vs cybernetics

Cybernetics, often commonly called computer usage and its impact on railway operations and planning have been in the news lately. For example, the Third International Symposium on Railway Cybernetics was held in Tokyo, Japan in April. Last month the Data Systems Division, AAR, held its annual forum in Denver, Colo. As of January 1 this year IBM unbundled, that is, users now pay for software such as computer application programs and systems engineering, as well as some computer maintenance. Burlington Northern, Penn Central and Santa Fe have, or will open, new computer-controlled automatic classification yards this year. And a general awareness by managers that with third-generation computers, they can be inundated with paper output.

The point is—are managers in danger of being controlled by computers? It should be the other way around, that is, the computers are tools to help managers work more efficiently and do a better job of managing.

It is becoming all too apparent that with the computing power now available, plus analytical techniques and tremendous power and capacity of today's software, that the computer is a very powerful tool of the management of businesses. But, it is also becoming clear that something must be done to improve the quality of computer outputs. The old comment about "garbage in, garbage out" has more or less been taken care of. The real question is: Are today's computer outputs really helpful to management?

Generally, the comments made by those "in the know" is yes, but there is along way to go. Obviously, with managers becoming more involved with computer usage and in many levels of management becoming dependent upon computers to a considerable extent—such as computer-controlled classification yards—the managers must be able to intelligently use the computer.

### SUGGESTIONS FOR IMPROVEMENT

Some of the following suggestions may help to improve the situation:

—Promote a closer working relationship among managers and computer or data processing experts.

—Revise, rewrite or write new computer programs with the end user in mind. Develop sophisticated edit routines to extract practical information for the manager.

—Involve managers with programmers in preparation of computer programs. In some instances it may be desirable to have the managers write the programs.

—Where practical, and from an economic standpoint, make use of computer software firms to develop programs.

—Exchange programs with other railroads (and possibly other businesses, such as shippers) where the programs have proved useful and successful.

—Where possible provide computer-to-computer exchange of information between railroads.

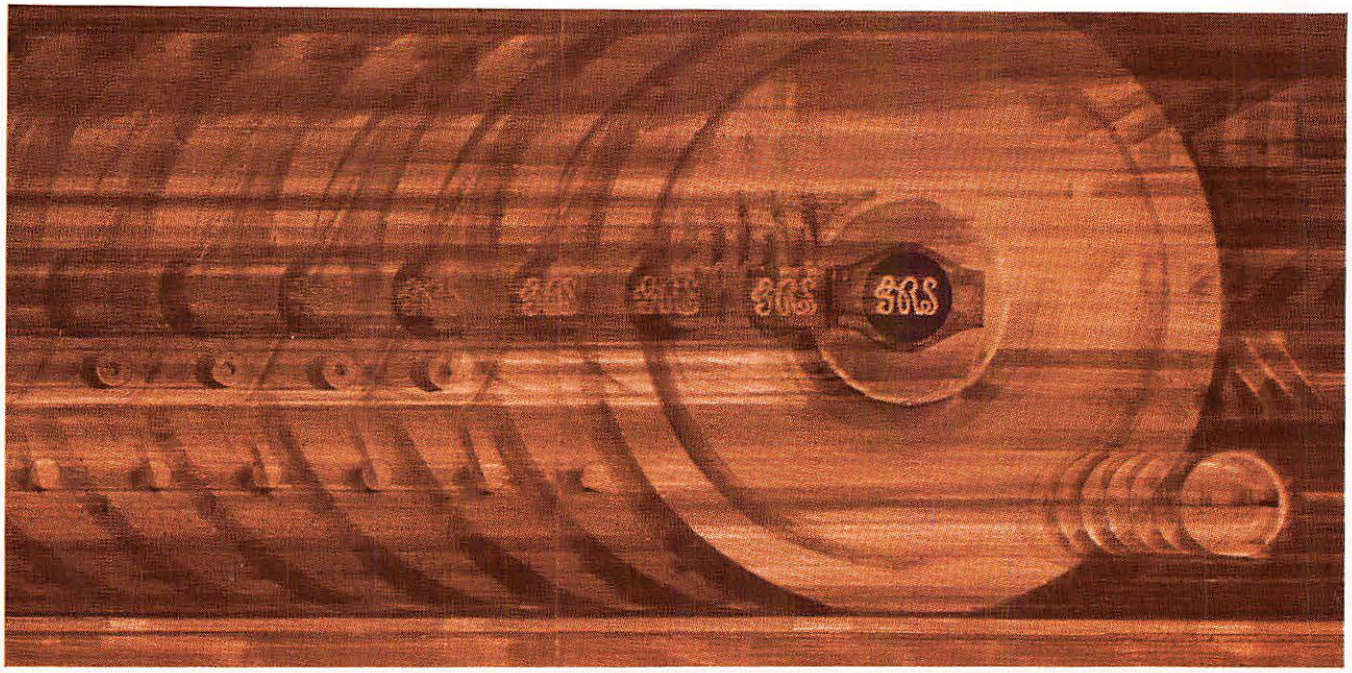
—Provide useful information upon which the manager can take action, and enable him to receive reports upon such action.

Probably one of the greatest incentives for a closer working relationship between managers and data processing people is that together they can do a tremendously effective job for the railroad. Remember, it's the entire railroad operation that counts. A good adage to remember: Do not become so preoccupied with the pine needles that you do not see the forest.

### EDP GIVES GREAT MENTAL LEVERAGE

The cybernetics revolution now taking place can provide the manager and other computer users guidance in managing. "The revolution relates to the increased mental leverage people, especially management people, are acquiring through developments in this field. Something is being added to rather than taken away from people. Management people individually may expect to be deeply involved fairly soon, and if they are not already, as practical users of these new tools. This, on the part of some, may require a different view to be taken than when other technological developments found application in the railway industry," writes Eric P. Stephenson, vice-president cybernetic services, Canadian National.

"Responsibilities of managers will have changed drastically by 1980. Routine decisions will be made in the computer; supervision from central headquarters will be more intense than before; railroad operations will become cleaner, surer, less haphazard, and the employees—men and managers alike—will take pride in this modernized, more efficient operation. There will be fewer employees to supervise, less clerical work to oversee, less confusion in yards, and more time to devote to planning improvements in operations. The railway man will be well paid, better educated, and find far greater satisfaction in his work than he does at present," said Alan S. Boyd, president, Illinois Central, at the Third International Symposium on Railway Cybernetics.



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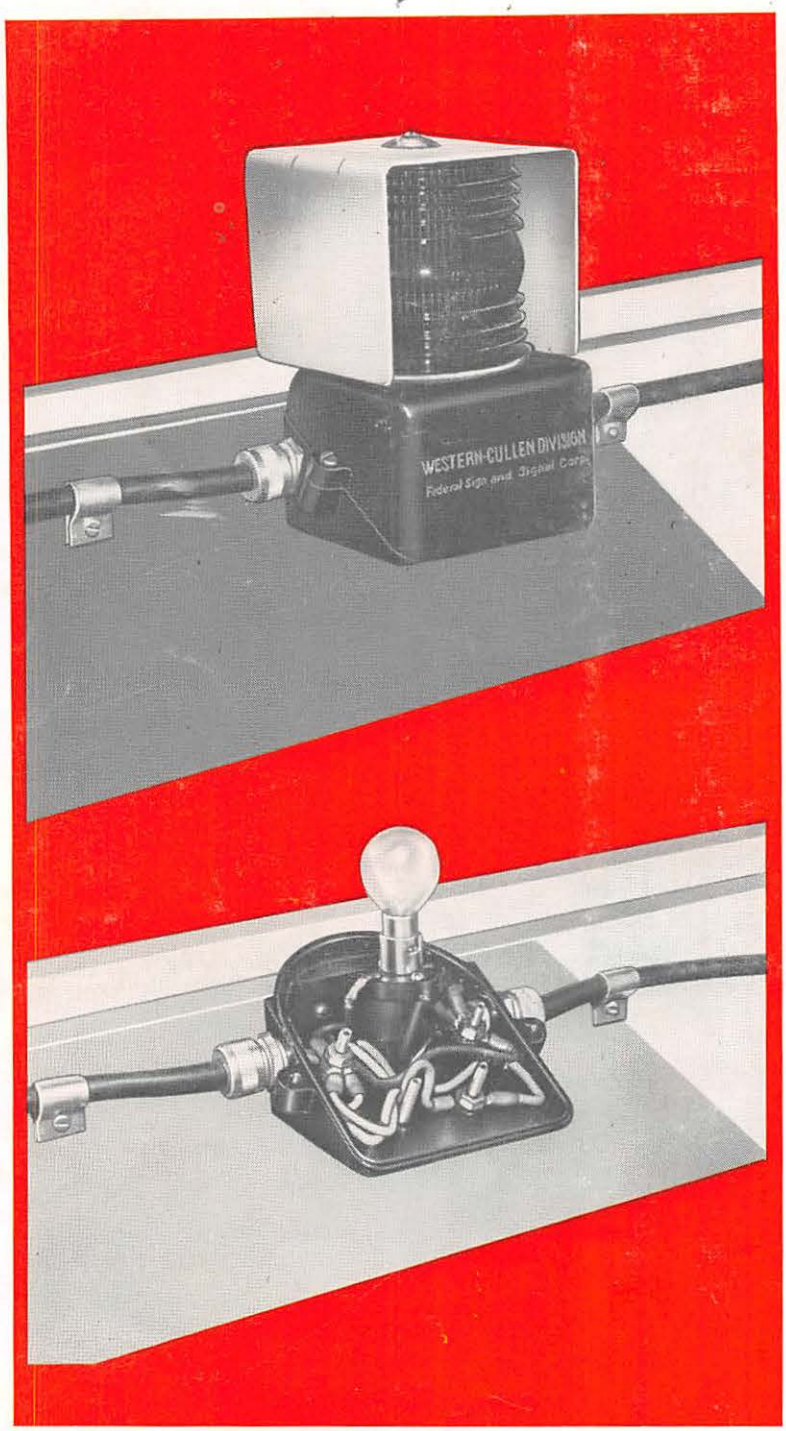


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